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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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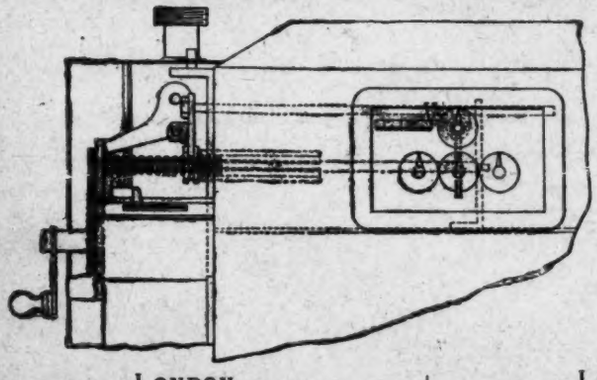

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VOL. CXLV., No. 2908.] TUESDAY, FEBRUARY 4, 1919. [71ST YEAR.

EDITORIAL NOTES.

A Strong National Gas Council Assured.

THE gas industry has made up its mind. It must have a powerful central organization of gas undertakings; and it means to have it. The undertakings constitute the foundation and main fabric of the industry; and it is therefore for them to take concerted action in all problems and controversies affecting the interests of the industry. They have decided to take their rightful position. The 31st of January was the limit to the period fixed for signifying intention to become members of the new National Gas Council by those undertakings that desired to take part in the establishing of the District Executive Boards and the election of delegates to serve on the Central Executive Board. Upon inquiry that day, we learned that the response has been one which assured a strong, capable, and representative body. Round about 400 gas undertakings have already become members. As many more can come in as the number still outstanding; and no gas undertaking the management of which has any appreciation of the fact that the political affairs of the industry cannot to-day be dealt with by any single undertaking will care to remain outside the new body. The 400 gas undertakings so far enrolled include practically all the larger ones, and a good number of those in the descending scale of size. The Council should be a united body of all grades and conditions of undertaking. All the Metropolitan Companies have come in; and every district in England and Scotland is well represented. Scotland has shown a keen interest, resulting in a large adhesion. Ireland is the only weak part of the United Kingdom. This is a fault that can be remedied. The Council is to be the Parliament of the gas industry, which will originate, negotiate, and defend—the Central Executive Board taking its instructions from the majority vote of the elected representatives of the district constituencies. It is an organization long wanted, and now at hand. Through it there is hope for better recognition and more effective action, both of which are much needed to-day, as any vigilant and intelligent observer of material industrial developments can see for himself. A little later in this issue we print a list of the arrangements made for the district meetings at which the District Executive Boards will be established, the local officers appointed, and the representatives for the Central Executive Board elected. Afterwards will come the London meetings. The development of the new Council is proceeding systematically; and it is for the management of every gas undertaking in the membership to do its part to make the new Council an organization worthy of the industry and valuable to its interests.

Necessity and Opportunity—Lord Moulton's Hope.

SOME impressions that are made upon the mind are deep and permanent, and their influence never ceases. Such impressions were made upon the minds of many men in the gas industry by the Presidential Address that Lord Moulton delivered to the members of the Institution of Gas Engineers last June. The address was by a qualified observer and critic. Wisdom, warning, and counsel were there; and many men we know left the meeting with good intentions and resolutions. The impressions made by the clear call to action and refoundation remain; the good resolutions of many men are unshattered. But time passes. We were at war then; hostilities have since ceased; the terms of Peace are being discussed in Paris; and no longer is the industry being called upon for the materials for explosives production. As yet, however, no real definite action has been taken in response to Lord Moulton's appeal, warning, and counsel. The "JOURNAL" has worked hard to get a move on. There have been some incipient attempts; but they have not penetrated far, nor have they been rewarded by success. Perseverance, however, has not manifested itself in pronounced form. We fear the reason is that—though there would be large support in the industry to any movement to get it on a foundation more in harmony with current circumstances—the months of difficulty since June last, and still continuing, with trouble as to coal and labour of unprecedented gravity, have caused consideration of the important future to suffer through concentration upon certain more immediate claims.

The present accentuation of difficulties and anxieties renders the more imperative the need for the industry to get its legislative conditions established in revised form, and its potentialities recognized in Government quarters. Not only was the necessity for this put forward with no uncertain voice by Lord Moulton, but he emphasized the seriousness of missing an opportunity for carrying conviction which the immediate proximity of the industry's work for the Government, the country, and its Allies had opened up to it. The necessity is admitted, and the opportunity is acknowledged. But there is nothing of an overt nature showing that anything really effective is being done, other than in connection with coal conservation; and in this matter what we believe will prove to be a powerful report is now about ready (if not actually so) for presentation. However, the beginning of this work—which is only one of several matters requiring consideration—was belated; and now in the opening of the new Parliament we are threatened with the first steps to enactment in the interests of electricity supply. The report should have been placed much earlier in Government quarters where confident opinion has already been moulded on the shallowest *ex parte* information.

With the passing of time, the grip upon our opportunity is lessening. This is our deliberate view; and if we properly interpret some words at the close of a letter which Lord Moulton recently addressed to Mr. W. Doig Gibb (and a request to make reference to which has been kindly granted to us), he, too, has some uneasy consciousness that the industry is not so actively taking advantage of the opportunity as it should do. The words his Lordship used are these: "I cannot bear to think that the gas industry will fail to take "advantage of so favourable a moment for wisely asserting "its claims for help and recognition from the State, for "whom it has done so much in the last four years." The introductory words: "I cannot bear to think that the gas "industry will fail to take advantage," to us implies that at any rate doubt has crossed Lord Moulton's mind. This doubt, if it exists, must be dissipated by act. His Lordship has known the gas industry long; he has lived in close association with it for four years or so. He knows well its inherent power to develop, given favourable conditions. But the conditions are not to be secured without an effort, backed by strong will; and the time when opportunity is at its best will not last for ever. The Explosives Supply Department is nearing its dissolution. Lord Moulton is not, however, immediately severing his relationship with the gas industry. He is the President of the British Commercial Gas Association and of the Society of British Gas Industries. A year, however, in these full times passes with express speed. The memory of the assistance rendered to him by the gas industry in the war-stressed days

that have gone will not pass; but the "official" ties will in measurable time be no more. We should not like these ties to be cut without substantial evidence that the friendly counsel of last June had borne good fruit, and that the industry had not missed an opportunity never before presented, and never likely to recur.

The Gas Light Company in the Last Year of the War.

The tale that chairmen of gas companies will have to tell the proprietors at their meetings the next few weeks will be more remarkable than the already extraordinary ones that have had to be narrated during the preceding years of the war. Many will have to speak of reduced gas business owing to the rationing of fuel and lighting, of the lessened amount of coal carbonized, of the consequent smaller production of residuals, and, reduced business notwithstanding, of the working expenses that never during the hardships of previous war years have been at such peak figures as those shown by the past year. Coal has cost far more not only per ton, but, albeit the lessened quantity carbonized, in the gross and net amounts. Despite the smaller volume of business, too, in gas and residuals, labour charges have ascended still higher. And both in regard to coal at the pithead and labour, it cannot be confidently asserted that gas undertakings have as yet been trading at the highest figures. Shipping freights will give some relief to the concerns using seaborne coal; but the future is still darkened by a good deal of uncertainty. In inaugurating his appearance next Friday before the stockholders as Governor of the Gas Light and Coke Company, Mr. D. Milne Watson (in succession to Mr. John Miles, who has retired to the position of an ordinary member of the Board) will have plenty of material, as will other chairmen of gas companies, with which to spin an address as to past experiences and immediate prospects—not that much can be said as to the latter with affairs in the chaotic position of the present day. There is, however, one thing to which the Governor can point with pride; and it is that, while so much has been uncontrollable and unforeseeable, the financial forecasts made by the Board have proved correct, with the result that, after paying the low interim dividend of £2 18s. 8d., and the meagre 3 p.ct. for the past half year under the Statutory Undertakings (Temporary Increase of Charges) Act, the Company will have £380,744 to carry forward, compared with £251,044 a year ago—an improvement of £129,700, which is a diminutive amount among the trading figures of the Company. But it must be remembered that part of this difference is due to the smaller distribution of dividend than in 1917, when throughout the year it was £3 14s. 8d. In these critical times, the carry-forward is not even now so large as could be wished; for during war time additional expenditure has had the bad habit of coming without presage, and often without any chance of making provision for it until some period after its incidence.

This can readily be shown by reference to the sudden increases that came upon coal in the course of the year, through the necessities of the Coal Controller, and to the repeated demands made by labour; and coal miners and gas workers are now asking for further consideration. Last year, as the Company's accounts disclose, the manufacturing materials—coal, oil, and coke—and labour took between them no less than £5,535,543 out of the total expenditure of £6,690,745, or out of the revenue of £7,740,844 a five-sevenths part. Labour required last year £1,862,194, or £337,658 more than in 1917, and £798,115 more than in 1913. On the other hand, for the past year the ordinary stockholders only receive—including the interim dividend and the one now to be paid—for the many millions of capital subscribed for carrying on the undertaking and giving men employment, £483,535, which is roughly 25 p.ct. of the amount drawn by the employees as wages. The total cost of manufacturing materials was £3,673,349, which was £200,361 more than in 1917; and as wages absorbed £337,658 more—these two increases alone amount to £538,019. While these costs advanced so considerably, there was less gas sold by 7 p.ct. compared with 1917. In volume, the amount sold was 26,418,746,000 c.ft., or a reduction of 1,954,109,000 c.ft., mainly due to the restrictions imposed by the Rationing Orders of the Coal Controller. These are gigantic figures. The reduction in the sales was produced by the private consumption of gas being less by 2,009,266,000 c.ft., with the public lighting more by 55,157,000 c.ft. With this fall in business, the quantity of manufacturing materials used decreased. Coal was required to the amount of 1,861,903 tons; but although this was lower by 238,722 tons than in 1917, £3,154,672 had to be paid for it, which was more by £186,896 than was paid for the larger quantity in 1917. A considerably less quantity of oil was used in carburetting water gas—5,750,032 gallons, compared with 9,126,311 gallons in 1917, or lower by 3,376,279 gallons. This heavily reduced quantity of oil cost £277,755, or less by only £41,141. The coke required for water-gas production cost £240,922, or an increase of £54,606. Deducting the receipts for residuals, £1,923,114, from the total outlay on manufacturing materials, the net cost of these was £1,750,235, or £274,306 more than in 1917. These figures have not only a war time significance, but we are afraid they are indicative of the future higher costs of carrying on business, which will not be peculiar to the gas industry.

From manufacturing materials used, 29,210,083,000 c.ft. of gas were produced. Of this, 22,254,499,000 c.ft. were coal gas, and 6,955,584,000 c.ft. water gas. As the quantity of coal carbonized was 1,861,903 tons, the average make of gas per ton was 11,952 c.ft., which was only 19 c.ft. short of the production per ton in 1917, but was well behind the 12,689 c.ft. of 1916. Quality of coal and the lessened use of oil no doubt account, or partly so, for the reduced make per ton of coal. The quantity of water gas mentioned as having been made was 622,601,000 c.ft. more than in 1917. But the Company were more frugal in the use of oil last year, owing to the very good reasons of short supplies and high costs—the consumption averaging only 0·82 gallon per 1000 c.ft., against 1·44 gallons in 1917. The quantity of coal used being smaller, the total receipts from residuals—£1,923,114—were lower than in 1917 by £73,945. Coke yielded £1,272,740, or less by £23,119; and ammoniacal liquor and sulphate of ammonia, producing £249,658, were down by £64,101. On the other hand, breeze, contributing £41,844, gave an increase of £2366; and tar and tar products, producing £358,831, showed an improved return of £10,868.

It has been seen that business in gas decreased by 7 p.ct. But the revenue from gas went up to £5,304,635, from £4,474,814 in 1917; this being due to an increase in price to 4s. 4d. per 1000 c.ft. from the reading of the meters last June, and, of course, necessitated by the forward march of expenditure. This advance in price would—without the intervention of the Statutory Undertakings (Temporary Increase of Charges) Act—have brought down the dividend to £2 2s. 8d., instead of the poor 3 p.ct. now allowed. If there is not much for which to thank the Act, such as there is we must acknowledge it. But that by the way. Meter-rentals, bringing in £160,542, were £1274 to the good; and stove-rental, contributing £185,278, gave more by £5461. The rental of fittings fell by £52,713, to £150,717. The increase in the number of gas-stoves sold and let on hire was 4811, which is a slowing-down of the rate of progress. Men and materials have been accountable for this in recent times. On the other hand, the year showed a decrease of 5966 in the number of gas consumers. The figure looks a substantial one. But this is the Gas Light and Coke Company, with (at the close of 1917) 826,353 consumers on its books. New building, too, has not been going on; and there has been no compensation for removals and other changes in conditions. But sufficient as to income, which totalled to £7,740,844, or an increase of £711,294.

Beyond the figures as to the expenditure on manufacturing materials, there is little to say concerning the debit side of the accounts. The inflictions of materials and labour costs find further embodiment in the charges for repairs, maintenance, &c. Under works and plant, a charge of £862,281 for repairs and maintenance is more than in 1917 by £155,015; mains and services called for £224,904, or £6572 more; repairs and renewals of meters claimed £248,963, or £68,754 more; and repairs and renewals of stoves asked for £206,157, which is an augmentation by £5611. Rates and taxes also spurted upwards. An item over which the employee co-partners can rejoice is a charge for co-partnership of £40,000 (against £2440), due to the new system under which the bonus ranks with the percentage payable to the ordinary stockholders. The total expenditure, being £6,690,745, is an advance of £690,375 upon 1917. The balance carried to the net revenue account is £1,050,098, or only £20,918 more than for 1917. Thus one sees how closely the Board estimated requirements, despite

the difficulties of doing so. And similarly it points to the increase in the carry-forward being mainly due to the lower reward of the ordinary capital. Looking over these points, the proprietors will anticipate much interest in the address which the new Governor will deliver at the forthcoming meeting; for these are critical days; history is being made for the industry; and constructive work awaits decision and development.

Government Encouragement and Protection.

IN the extensive inquiry that has been proceeding during the war with the view to reconstruction, the electrical industry has had a splendid innings. It somehow or other, contrary to the gas industry, has got in every time; and we cannot help thinking there must be some personal influence at work which ensures this. How is it the gas industry has not similar influence? Have our methods of setting to work been at fault? Is the gas industry lacking in push? Or is it that, having for the last four-and-a-half years to act, through circumstances, so much on the defensive, in order to guard its interests and save itself from financial ruin, the industry has been so unfortunate that it has made itself objectionable to those in high quarters? We cannot supply the answers; but the fact remains that—though the industry has during the war been absolutely indispensable, and has shown that it produces more from coal than any other industry, that its processes are highly efficient, and are capable of being made still more so, and that town communities and industries cannot do without its services—in the reconstruction inquiry it has been largely bye-passed, while its chief competitor (using coal with less efficiency, and with ramifications of service of a far less diverse order) has received unlimited consideration, and has been pushed to the fore with conspicuous ardour. It would be interesting to have some authoritative expression of opinion as to the causes. There was the voluminous report of the Power Sub-Committee of the Coal Conservation Committee of the Ministry of Reconstruction, the very effective report of the Electric Power Committee of the Board of Trade, the report dealing with the expansion of the electrical trade after the war, and now there comes a report of the Electric Branch Committee of the Engineering Trades (New Industries) Committee appointed by the Ministry of Reconstruction, in which encouragement and protection for the electrical trades are urged upon the Government. The Government are advised to do this and that, all with the view of broadening the base of the electrical industries, and defending them from the attacks of manufacturers of other countries. In the gas industry manufacturers have largely protected themselves by their advanced methods of manufacture and progressive efficiencies. Another Branch Committee, however, realizes that high-power gas-engines and gas-mantles have been the victims of heavy competition from abroad. In these, and the cheap lines of fittings and burners, we could do with protection against foreign production. The exotic poorer classes of gas fittings and mantles especially have been of considerable disservice to the industry, and in a manner too well known to need description. Generally speaking, our gas plant and apparatus manufacturers have defended themselves. Nevertheless, we have no doubt they could do with more Government encouragement; and one way in which this could be provided would be by giving less preferential treatment to their home electrical competitors. We are not against any encouragement of our home industries by the Government, nor against their protection from invasion by goods manufactured abroad under conditions putting British manufacturers to disadvantage. But we do claim that encouragement and protection should not be afforded one home industry to the detriment of other home industries. Whatever encouragement and protection the Government can give should be absolutely of a disinterested order, and be extended equitably in the case of competing industries.

Industrial Ideals and Labour Ways.

THERE is no disposition on our part to belittle the condition of affairs in the labour world. There are sinister aspects about it. The trouble is all the work of a few extremists we are told; and a comparatively small percentage of it represents labour in ferment. We have to separate actual strike and disorder from immoderate demand made imperiously and unyieldingly, with strikes and possible disorder to follow. Immoderate demand to-day covers a larger area of the labour world than actual strikes; but if reason does not prevail on the part of the men, the balance will before long be turned, and the opposite condition will be upon us. The gravity of the situation cannot be measured alone by Belfast and Glasgow, or the sporadic local strikes which have been witnessed. The whole situation has to be brought into focus; and to do this is the work of a clever man.

The ideal measures that have been produced Whitehall way, by which joint conference is to avoid unpleasantness and promote prosperity, are being hustled away by events into dark corners. Anything in the nature of the product from the Whitley formula does not appeal to shipbuilding and engineering men in Belfast and Glasgow, who are said to be led by a few hotheads. Whether this be so or not, the facts remain that their following is great, disorder rules, production is largely stopped, and the peace and conveniences of the cities considerably disturbed. In the shipbuilding and engineering trades, joint bodies of representative men and masters agreed before Christmas upon a forty-seven hour week. Now in one place the men demand a forty-four hour week, and in the other forty. The agreement has been trampled on; and against the trade union leaders there has been revolt. This is not a condition that can be treated lightly. The trade union leaders must defend their authority; and the Government must stand for law and order by recognizing only the authority of the elected leaders of the unions, the decisions of accredited conferences, and not the anarchical methods that have been witnessed during the past week, which right-minded men, whatever their place in the industrial or other spheres, must regard as a disgrace to those who have participated. We read of riots, and their accompaniments—of broken heads and looting; of public services, such as gas and electricity, being made the instruments for inflicting unemployment upon countless satisfied people, who wish to be allowed to proceed with their work peaceably; of hospitals and other public services being grudgingly allowed only sufficient gas and electricity to prevent disaster; of the comfort of domestic life being intruded upon; and of trading being disorganized—all by acts which might be expected from desperadoes or the vassals of the old Prussian military *régime*.

All this is bad for local industries; but in other directions there are movements that are stifling the commercial power of industries by excesses which are destroying all just relationship between hours and production and pay. War rates of wages are now being discarded as insufficient, and higher rates are being demanded. In the gas industry, there should be perfect unity, but at the same time discretion should not be abandoned as being a useless virtue. Outside its own internal troubles, the labour conditions in connection with the coal supply, and the railway and transport services, are disconcerting to the industry. In these directions no sooner is one thing settled than from it something else develops, which again ruffles conditions and creates uneasiness. Here the unions are negotiating; but with autocratic mien. Their attitude is that there must be no parley; demands are irrevocable; and compliance must be immediate. There has been much talk of a new industrial world, and of the co-operation of both employers and employed. The ways to the realization of these beautiful and beneficial conditions cannot be those which have lately been adopted by labour.

National Benzol Association Meeting.

It is hoped that the meeting of the benzol industry, to be held, under the auspices of the National Benzol Association, at the Caxton Hall, Westminster, next Tuesday, at 2.30, will be as representative as possible of producers of crude and refined benzol and its homologues. It is highly important that, at this initial stage, the Association should have the utmost support of all producers and distillers; for now is the right time to establish a firm foundation upon which to operate for the advancement and the protection of benzol interests.

Sir Eric Geddes and Profit-Sharing.

We are glad to see that Sir Eric Geddes is a great believer in profit-sharing where it is applicable, though, at the dinner of the National Alliance of Employers and Employed last Tuesday, he had nothing very encouraging to say concerning it. He seems to base his idea that it is not very generally applicable on statistics

published in 1912, which showed that out of 300 schemes that had been started, 163 had died a natural or unnatural death, and that the remainder only employed about 100,000 people. He gave gas-works credit for being the great outstanding success in profit-sharing; but here labour represents roughly about 30 p.ct. of the total expenditure. On the other hand in the coal industry, labour takes about 73 p.ct. of the total expenditure; and obviously successful profit-sharing cannot be based on that. On the railways, again, 65 p.ct. of the expense is for labour; and railways earn a dividend of 3½ p.ct. on their ordinary stock. If 1 p.ct. of this was taken, and the dividend reduced to 2½ p.ct., the average return on a profit-sharing basis to employees would be only 3s. per week. However, he does believe that profit-sharing gives the employee an insight into the essentials of management by figures, and so he realizes the effect of changes. This removes distrust, which, with suspicion, is at the bottom of our troubles. Therefore we see Sir Eric is favourable to profit-sharing where it is applicable; but it does not do to too finely narrow-down applicability on the evidence of old statistics. It was a wise thing on his part to have used the word "unnatural" when referring to the 163 having died "a natural, or unnatural, death." The conditions of application have had much to do with success or otherwise; and a revision of conditions might have had a beneficial effect in reducing the number of schemes that have suffered extinction.

Gas Coal Stocks.

The "Iron and Coal Trades Review" says the position of coal stocks at gas-works is appreciably worse; the latest list showing 53 works with under one week's stock (including 18 with under three days), and 95 with under two weeks. As many of the pits that have been standing recently are large producers of gas coal, it may reasonably be expected that the next list will show even a worse position than this.

Large Gas-Engines or Gas-Fired Boilers.

There are several problems that require to be settled in the matter of the use of gas in large power engines and under boilers for the generation of steam. Responsible engineers are divided in their opinions as to whether it is more profitable to utilize producer, blast-furnace, and the lean part of coke-oven gas direct in large power gas-engines or under boilers for steam-raising for use with turbines. The gas industry has an interest in this matter, because if gas-works are to become the central sources of supply of power gas (which is a development in industrial areas that is open to them), the question is one in which it will have to concern itself, so as to proceed in the right direction. It must, however, be borne in mind, when considering the discussion [p. 217] which took place on Mr. T. M. Hunter's paper before the South Wales Institute of Engineers last year, that the speakers on that occasion were not alluding to the clean and relatively high calorific power gas supplied at the present time from gas-works, and which is profitably used in engines of lower powers than those to which reference is being made here. It will be seen that, while there are some engineers who believe that, with producer, blast-furnace, and other waste gases, the large gas-engine will with improvements fully justify itself, the South Wales engineers at all events generally favour the idea of the utilization of the gas for steam-raising with turbine work. Though the gas-engine can show a somewhat larger thermal economy, the practical difficulties with it are such that, from their point of view, the economy is annulled and they would rather have the comfort of the steam-turbine. But the large gas-engine must not be blamed for all the difficulties; to the character of the waste and not over-clean gas with which they are fed must be attributed part of the trouble.

Other Points.

In the discussion, there was reference to the richer part of coke-oven gas being used for boiler-firing. We should be sorry to see this, if it could be conveniently piped for town use, though, with the high efficiency of (say) the Bonecourt boiler—the gas being deprived of its benzol and ammonia—even the use of the richer calorific part of coke-oven gas for steam-raising is not a proposition to be despised. Another point made by one of the speakers was that the complete gasification of coal in producers with ammonia recovery does not offer sufficient inducement over coal, particularly in view of the prospect of keen competition with the synthetic processes for making fertilizers. Here, again, the question of how the gas is produced and utilized, and the efficiency with which it is utilized, is a matter of importance in relation to decision. However, while there is the division of opinion at home, information comes along from time to time of immense high-power gas-engine plants being constructed in America and on the Continent. The engineers who are responsible for these new plants are not men who engage in that unprofitable business of "buying a pig in a poke."

Various Gases and Burner Efficiency.

The United States Bureau of Standards at Washington have been carrying out some experiments with various gases; but, like the work of our own Gas Investigation Committee, the report on it so far received is only of an introductory character. The investigation, however, does not cover such a range of gases as at home here; and to the stage so far reported upon only upright and inverted incandescent burners have been experimented with. The findings are just as would have been imagined. With various gases the inverted burner gives greater uniformity of efficiency than the upright one. As stated in the report (portions of which are reproduced in this issue), the upright burner shows a distinctly higher efficiency with lean water gas than with city gas, both at maximum candle power and maximum efficiency adjustments, and the advantage is greater at maximum candle power than at maximum efficiency. The inverted lamps, on the other hand, show no difference in efficiency, within the limits of experimental uncertainties, with the lean water gas and the city gas, either at maximum efficiency or at maximum candle-power adjustments.

Atmospheric Fertilizers.

Now that the war is over, producers and dealers in fertilizers are beginning to consider the possibilities of their synthetic competitors; but they are more or less trying to view the future with an (at present) impenetrable blank wall before them. In the year before the war, it was estimated that the total quantity of synthetic nitrogenous fertilizers only equalled 5 p.ct. of the world's consumption of fertilizers. But the war itself has made all the difference. We know that Germany kept itself well supplied with the fertilizers it needed for agricultural purposes, and the nitrates that it required for war productions, by largely supplementing its capacity for obtaining nitrogen from the air. The news that, with the cessation of hostilities, some of the German synthetic plants have been shut-down, shows that that country has plant and to spare for its current needs; and therefore it may be that, when Germany is free to again use the seas, the disused plants will be restored to action. This is a possibility, though not a certainty. The initial costs of these plants are high; and their running expenses are more or less but vaguely known. There must be a point at which they cannot compete with fertilizers produced from natural materials. However, the plants are there ready for use. The erection of plants for obtaining and utilizing atmospheric nitrogen commenced in this country during the war; and in America and other of the belligerent countries large plants have been erected or are in course of erection. It is probable that considerably altered conditions will, before long, exist in the fertilizer markets, both at home and abroad.

Nitrate and Doubts.

The Chilian nitrate dealers do not like the outlook beyond the conditions that now and will immediately prevail. There is no question that, for some little time at least, the world will absorb all the fertilizers that will be available; and shipping will become easier. The nitrate policy seems to be to make hay while the sun shines. For the moment not only shipping but the Allied Governments will not permit free dealings in nitrate. The Governments have themselves—at any rate the British Government has—large quantities of nitrate to dispose of, which were purchased for munition purposes. Taking into consideration the whole of the circumstances, the Chilian Government are proposing legislation to give them control of the production and sale of nitrate; the profit to be divided between the producing companies. It is considered that this will assist to stabilize the position and make the outlook clearer. Beyond that there is a doubt engendered by synthesis.

PERSONAL.

Mr. F. L. HALFORD has joined the Shell Marketing Company, Ltd., where no doubt he will continue to meet many of his friends in the gas industry and tar-distillation trade. For a short while, he will be working part-time at the Explosives Department of the Ministry of Munitions, until the work with which he has been concerned there has been wound-up.

Miss RUBY STUBBINGTON (Lady Superintendent), of the South Metropolitan Gas Company, who has in many ways assisted in the cause of National Service, has had conferred upon her Membership of the Order of the British Empire.

CAPT. CECIL J. FALK, 7th Batt. Wilts Regt., eldest son of Mr. Max Falk, the Chairman of Messrs. Falk, Stadelmann, and Co., Ltd., has been awarded the Military Cross. He has served in Salonika and France with his regiment for over two years, and has done consistently good work.

Mr. HARRY WADSWORTH, of the Bingley Gas-Works, has been appointed Gas Manager (with a knowledge of electricity) at Knaresborough—a combination required by recommendation of the expert adviser (Mr. Frank H. Robinson) who investigated the works. The salary is £182 per annum. Mr. Wadsworth has been at Bingley six years, and has been Assistant Manager for the past two years. He was selected out of 53 applicants.

The Dundee Gas Committee have increased the salary of Mr. ALEX. YUILL, their Engineer and Manager, from £750 to £1000 per annum. The Convener (Mr. High) pointed out that this is the largest revenue producing department of the city.

Mr. R. G. LEYTHAM, of the Lancaster Corporation Gas-Works, has been appointed Secretary of the Carnforth Gas Company.

Mr. W. H. POWELL, the Chief Cashier to the Birmingham Corporation Gas Department, retired at the end of last month, after 45 years' service; and at a meeting of the Gas Committee yesterday week, Sir Hallewell Rogers, M.P. (the Chairman), presented to him an illuminated address. This recorded with appreciation the long and effective work of Mr. Powell. Sir Hallewell expressed the hope that he would live long to enjoy the leisure of his well-earned retirement. Mr. Powell entered the service of the old Birmingham Gas Company in 1873; and when the undertaking was acquired by the Corporation, he continued in the employ of the Council. Having passed through various positions, he became Assistant Secretary in 1880, and held the office for twenty years. On the retirement of the Secretary (Mr. Edwin Smith) in 1901, Mr. Powell was appointed Chief Cashier in succession to the late Mr. Fletcher.

OBITUARY.

Sir ROBERT H. INGLIS PALGRAVE, F.R.S., the banker, who died last week at the age of 92, was Chairman of the Great Yarmouth Gas Company.

Mr. E. HALL BATCHELOR, physician and surgeon, of Bridlington, who died last week at the age of about 50, after two years' illness, was Chairman of the Bridlington Gas Company at the time he became ill. He was afflicted with paralysis.

Dr. HENRY J. STRONG, J.P., a director of the Ascot and District Gas and Electricity Company, and of the Worthing Gas Light and Coke Company, died on the 29th ult,, at his residence, Colonnade House, Worthing. He was 86 years of age.

Mr. A. J. HOPE, whose death occurred on Monday of last week at Banchory, was at one time Gas Engineer to the Nelson Corporation. He married a daughter of Mr. A. Nelson, J.P., an ex-Mayor of Nelson, and became a member of a cotton manufacturing firm.

Women in Industrial Occupations.

The Home Office have issued a memorandum dealing with the substitution of women in non-munition factories during the war, and based on information collected by the Factory Department of the Home Office after exhaustive and careful inquiries throughout the country. A general review is given of the nature of the work done by women, and their capacity for doing it; and the opinion of the Factory Department is recorded that the substitution has proved successful in a great majority of cases, and that women have shown themselves able to take up many of the more skilled processes which have hitherto been reserved for men, and to carry them out completely and well—displaying unexpected readiness for work which at first sight seemed highly unsuitable for them. After excluding the occupations which must be considered unsuitable in normal conditions for women, there remains, the Factory Department believes, "a hopeful field of fresh employment for women where their war experience can be turned to account, and should prove a national asset of great value." The trades which, from their nature and the conditions of work, are said to appear in the main unsuitable for female labour in normal times include gas manufacture.

NATIONAL GAS COUNCIL MEETINGS.

IN the editorial columns of this issue reference is made to the reconstituted National Gas Council; and, in connection therewith, it may be pointed out that notice has already appeared in the "JOURNAL" [*ante*, p. 108] of the series of meetings to be held in London on Tuesday, the 18th inst. The inaugural meeting of the Council under the revised constitution and rules will take place in the Central Hall, Westminster, S.W., at 11.30 that day; and there will subsequently be a meeting of the separate Committee of Employers. Formal invitations to this meeting will be sent in due course to the members elected by their undertakings.

Preceding these meetings, it will, of course, be necessary to hold district meetings, in order that the District Executive Boards may be formed, and members appointed and nominated to the Central Executive Board. The arrangements for these district meetings have already been made; and the following is the list of fixtures:

EASTERN DISTRICT.—In the Council Chamber at the Guildhall, Cambridge, on Friday, Feb. 7, at 2.15.
MANCHESTER DISTRICT.—In the Council Chamber, Town Hall, Manchester, on Tuesday, Feb. 11, at 2.45.
MIDLAND DISTRICT.—At the Grand Hotel, Birmingham, on Thursday, Feb. 6, at 2.30.
NORTHERN DISTRICT.—At the Gas Offices, Newcastle-on-Tyne, on Friday, Feb. 7, at 2.
SOUTHERN DISTRICT.—At the Caxton Hall, Westminster, London, S.W., on Thursday, Feb. 13, at 3.
SOUTH-WESTERN DISTRICT.—At the Gas Offices, East Southernhay, Exeter, on Friday, Feb. 14, at 2.30.
IRELAND.—At the Gresham Hotel, O'Connell Street, Dublin, on Monday, Feb. 3, at 2.
SCOTLAND.—At the City Chambers, Glasgow, on Monday, Feb. 10, at 3.
WALES.—At the Gas Offices, Bute Terrace, Cardiff, on Wednesday, Feb. 12, at 2.30.

Elected representatives of gas undertakings who have sent in forms of application for membership should receive an invitation to attend one of these meetings; but in the event of no such invitation being received at an early date, immediate application should be made to the Council.

ELECTRICITY SUPPLY MEMORANDA.

IT is necessary that in these times, when changes in condition come upon us from one direction or another with almost diurnal regularity, that we should endeavour to keep in proper perspective those that more or less directly affect us. That it is difficult to do so is admitted; but without the effort there will be a losing of heads, which will not assist matters. The wages and hours' trouble is affecting the country generally; some industries more, some less, than others. The "Electrician" calls attention to a statement by Alderman Ball, the Chairman of the Nottingham Corporation Gas Committee, to the effect that increases in the cost of coal will greatly benefit electric undertakings at the expense of gas undertakings, because "electricity will need much less coal in proportion to the light and power produced." He also "failed to see how gas could compete with electricity on these terms." The "Electrician" does not comment on the statement. But apparently "Meteor" of the "Electrical Times" does not share in Alderman Ball's optimism regarding electricity, or his pessimism respecting gas. While all the technicalities of super-stations, long transmission, and a hundred-and-one other aspects of the electrical rejuvenation scheme are being discussed, in "Meteor's" opinion cheap electricity, with coal at the miners' ideal figure, would be no longer possible. "If the Government finds itself unable to deal with the present upward rush in coal and labour prices, it will have let fall upon the scales a heavier weight than all the accomplishments of electrical engineers can accomplish." So electrical opinion does not, it would appear, altogether coincide with that of our usually far-seeing friend Alderman Ball. There is good reason for the difference. The electricity industry is sharing in the effects of the rough-and-tumble work that is going on with the plausible intention of raising the standard of living of labour without any thought of seeing whether labour's measure of the standard will produce a balance with the power of home industries to live, compete, and forge ahead so as to be productive of greater benefit to all concerned—among other benefit, the ability to absorb more labour. Alderman Ball may be asked to consider the fact that the electrical system is such an inefficient one that the coal it uses only sends into the distribution system electricity per ton, equal on an average to 1,710,000 B.Th.U., and that some of this is lost in transmission, while the gas-works system, on quite ordinary lines, puts into the gas-mains 6,250,000 B.Th.U. per ton of coal used, and on to the market coke having a calorific value of about 14,500,000 B.Th.U. per 10 cwt., with, in addition, tar, sulphate of ammonia, and other chemical products. And gas engineers are looking to get an

A Wrongly Founded Opinion.

improvement of these results. There are those who have before them the ideal of 10 million B.Th.U. in gaseous form per ton of coal, without losing much on coke, while increasing the values of the bye-products in other directions. Alderman Ball, if correctly reported, must revise his pessimistic views as to gas in relation to electricity in the new circumstances as to costs.

Going Too Far.

The statement which the Institution of Electrical Engineers have, in the name of a number of other influential organizations, addressed to the President of the Board of Trade, and upon which comment was made in our editorial columns last week, showed indirectly that there is a very imposing amount of opinion in the electrical industry antagonistic to anything approaching the "nationalization" of electricity generation. When first the reformation of the electricity industry was talked about, and when there were indications as to the probability of the Government helping it by new legislation, reorganization, and even finance, there were some electrical men who almost danced for joy at the prospect. But we pointed out at the initial stage that it would be as well to examine carefully where this patronage was leading to. The Government have not done anything yet beyond the departmental inquiries, reports, and, it is quite likely, Bill preparation. But already their notions have grown and grown, until now the electricity industry finds the helping hand proposes to conduct it into something which has a strong flavour of nationalization about it. Electricity is placed as the third of nationalized subjects—railways and transport taking precedence. Sir Eric Geddes has been ear-marked to take charge of the Ministry of Transport, in which electricity is also to be sheltered. This is all going too far; it is not what the industry desired or bargained for. If the plans mature to the stage of which there has been vague prediction, it is feared that electricity will then be pushed into a very inferior position, and not get the attention it is supposed to deserve. Some electrical men have been very greedy in their desires for the industry. They have consequently attracted not only the attention of the Government, but of organized labour; and the industry feels most uncomfortable over its ambiguous position. Labour intends to press for nationalization. In the opinion of the Chairman of the Parliamentary Labour Party (the Right Hon. W. Adamson, M.P.), the nationalization of coal mines, railways, canals, shipping, and electricity supply is one of the best remedial measures for industrial unrest. The "Electrician," however, finds in the past four-and-a-half years there has been enough Government control to last a generation; we should say, for all time. Our contemporary, it is obvious, does not like the exactions of Government control. It is aware that industries do not flourish when subjected to anything more than the mildest form of Government interference. At present the industry has to deal with three Government Departments—the Local Government Board, the Board of Trade, and the Home Office. Our contemporary has now some difficulty in seeing how the functions of the first and the third departments, can be superseded, though it does not appear to think much of the Board of Trade—the body that, under new "management," has taken the lead in bringing about the scheme of electricity "reform" which the Government are now adopting. There is not much gratitude in the electrical industry.

Nationalization and Labour's Fewer Hours.

Labour is taking a large interest in the nationalization of electricity supply; but labour is unconsciously also pursuing a line of action in connection with electricity supply that will help to increase and not lessen, its cost for power purposes. The shorter working hours they are asking for and the increased leisure will make the attainment of a high load factor more difficult. This point was made by Mr. W. H. Patchell, in opening a discussion on national electricity supply, at a meeting of the Institution of Junior Engineers yesterday week. Economical supply depends chiefly upon the cost of fuel and capital charges, as well as distribution expenses and losses. Labour wants to work fewer hours per day; and it does not wish to work in shifts, other than where continuous production or operation is a public necessity. The result of this will be that manufacturers will (if they can afford it) have to largely extend their factories and machinery not only for meeting the increased production which the country is hoping for, but to compensate for the reduction of output that fewer working hours render inevitable. This means that the demand for energy will be greatly accentuated during the shortened working time; and naturally this will involve additional expense for electricity generation and distribution. Labour has a blind eye for effects. Its own demands and selected policy are quite enough for it; but the neglect of the effects constitutes labour its own most virulent enemy. What is the good of labour requiring the nationalizing of a public service when its own action in another direction will make the cost of the service greater than it otherwise would be? This may seem a bit complex to labour untutored in electrical matters, but the truth is there nevertheless.

Labour and Private Generating Plants.

There is another aspect of this matter. If labour is going to make the supply of electricity through the public cables dearer, all the more reason will there be for even those manufacturers who do not want hot water and steam besides electricity to stick to their private generating plants. Another good reason for this is found in a second direction, to which reference will be made presently. In the course of the discussion raised by Mr. Patchell (referred to in the preceding paragraph), Mr. Wilson, one of the technical advisers to the Coal Controller, remarked that anything that would cheapen electricity would be to the national advantage. But is Mr. Wilson really satisfied that what is proposed will cheapen it? Mr. F. W. Goodenough, Mr. W. A. Tookey, and Mr. Arthur Valon said enough to show that they have grave doubts on the subject, and that it is an open question whether a manufacturer would be, from the cost point of view, so well off under the national scheme as he would be from continuing his private plant. Mr. Valon was rather of opinion that, if electric power was to be nationalized, all power supplies should be treated the same. Examining the matter from the standpoint of the manufacturer, we rather think he will be better off in being able to patronize a free house than a tied one. If electricity is going to be put under bureaucratic domination, it will be better for him to have liberty to place his custom elsewhere, or to have his own private generating plant. Apart from costs, there is another way in which labour, where electrical power is employed, makes the private generating plant preferable to a supply from the public mains. The shipbuilding and engineering strike at Belfast has had its lessons. The municipal workers threw their weight in with the strikers; and the gas and electricity supplies were cut-off. The consequence was that large numbers of factory hands willing to work were deprived of the means of doing so. The factories that escaped longest from molestation were those possessing their own power plants. On the Clyde, there has been a stoppage of electrical energy. The electricity supply of Berlin has also recently been disturbed through a strike at all the generating stations. Labour unrest is assuredly going to be a factor in the choice of power.

Electric Heating.

Extracts from a valuable report on electric heating are published by the "Board of Trade Journal;" the authors of the report being the Hydro Electric Power Commission of Ontario This shows that, if all the immense potentialities of the water power of the country were developed, they would be altogether inadequate to cope with the demand for power for electric heating, if this were fostered to any considerable extent. The following points taken from the report may be commended to those enthusiasts who are hoping for a large development of electric heating. The Commissioners say that the difficulties in the way of utilizing electrical energy for heating purposes are: (*a*) The enormous amount of energy that would be required, and which could be more efficiently applied to other purposes; (*b*) the high cost of electric energy for heating as compared with other sources of heat energy. For example, there are about 80,000 houses in Toronto. If each of these was heated, and a demand of (say) only 12-H.P. per house must be met (probably a very conservative figure as an average for large and small houses), no less than 960,000 H.P. must be provided for houses alone—no factories, no offices, no works, no street cars, no houses even would get any lighting or power from this. A still further difficulty in supplying electric energy for heating on an extensive scale lies in the fact that all the heating is required in the winter only; and assuming that a maximum demand of 1,000,000-H.P. had to be met for supplying a city like Toronto, the load on the plant required for this purpose, throughout the summer months, would be practically *nil*. In other words, for five months every year this enormous plant would be idle. The capital cost of furnishing a million horse-power to Toronto, including hydro-electric development at Niagara Falls and all the switching and transforming equipment, together with transmission and distribution lines, &c., would probably be somewhere between $200 and $250 per horse power to deliver electricity to the consumers' houses. This would mean a capital investment of from 200 to 250 million dollars. This enormous sum, owing to the fact that the plant would be idle for nearly six months out of every twelve, would, during half its existence, be earning nothing; and the services of a large number of men would, of necessity, have to be retained throughout the summer months (during the non-earning period) in order that they might be available when required in the winter. The plant would only be used for heating during a period of six or seven months; and the consumers would have to pay the charges for the whole year during this period. The Commission are led to the conclusion that true conservation lies in using, to the fullest practicable extent, water power for the generation of mechanical power and fuels for heating.

Encouragement and Protection.

The Engineering Trades (New Industries) Committee of the Ministry of Reconstruction had a Branch Committee which has been inquiring into the production of and trading in electrical machinery and apparatus. This Branch Committee has now reported. It finds that, for most of the items comprised under electrical machinery and apparatus, there were in this country before the war ample manufacturing facilities for making them, and in certain cases for taking care of the export trade to other countries. These facilities, however, were not fully employed, owing to the importation of goods from other countries. Manufacturers are now extending their premises and facilities for the purpose of producing several articles which were largely imported prior to the war. They are doing this without aid from the Government, and purely on their own initiative. Therefore,

the Committee urges that encouragement and protection should be given by the Government. The best possible protection that could be afforded is for buyers to refuse to purchase anything (providing it can be produced at home) that has foreign birth. The manufacture of carbons has been taken up here during the war; and the Government are advised by the Committee to ensure the continuance of this industry. The production of insulating materials is another line which the Committee thinks should be encouraged and protected. The same with magnetos, porcelain articles required for electrical purposes, and glassware for arc lamps. It is, the Committee remarks, essential to establish confidence in the future of the electrical manufacturing industry by assuring it the support of the home markets; and it is entitled to Government protection in these markets against dumping and sweated goods. The war has helped to hasten free-trade theories to the scrap heap. Comment suggested by this report appears in our editorial columns to-day.

BYE-PRODUCT COKE-OVEN PLANTS.

Some United States Installations.

THE first issue for the present year of the New York "Gas Age" is a special bye-product coke-oven number, and contains some interesting descriptions of various representative installations in the United States.

There is, first, a description of the plant of the Seaboard Bye-Product Coke Company, which is said to represent the latest developments in coke-oven practice. The writer of the description—Mr. D. MacArthur—claims that it is due chiefly to its efficiency, seconded by the merited success of the Koppers type of oven, that America has in three years doubled its capacity for bye-product recovery—so rendering invaluable service to the country at war. In 1918, there were 9282 bye-product ovens in operation, producing at the rate of 32,200,000 tons of coke per year. Since 1908 there have been 5483 ovens erected, of which 4996, or over 91 p.ct., are Koppers ovens. In fact, some 72 p.ct. of the bye-product ovens in the country are Koppers ovens; and these are capable of carbonizing 33,000,000 tons of coal per year, and producing 24,750,000 tons of coke. The Company are now building 1124 ovens, to be completed this year; and these ovens will take an additional 7,600,000 tons of coal per year. The Seaboard Bye-Product Coke Company's plant at Jersey City is a recent installation of the Koppers Company. The products of this plant are: Coke, for foundry, blast-furnace, cupola, steaming, or domestic use; gas, for domestic purposes; tar; sulphate of ammonia; benzol; and naphthalene. The high volatile coal used in the plant comes from the Pittsburgh district, and the low volatile coal from the Clearfield district. The coal coming in at the top of the crusher and mixer building goes over a screen, which bye-passes the fine, and permits the lumps to enter a breaker. Two short belts then convey the broken coal to any one of three 250-ton mixer storage bins. Where certain coals are used, the quality of the coke can be improved by judicious mixing. This is accomplished by varying the depth of feed on the belts drawing from the three bins; all the belts being geared to the same drive at speeds suitod to the mixes desired. Recording gauges which chart the time and depth of feed, and electrical cut-outs which shut-down the mixer-drive the instant the coal runs out on any belt being used in the mix, are operated by lever paddles, which ride the coal flow. From the mixer belts, the coal is fed to two 150-ton per hour hammer mills, which work the coal through curved screens of ¼-in. perforation. Here, fine or coarse crushing can be obtained. This matter of fineness, like that of mixing, is second only in importance in its relation to gas yield and coke quality to the chemical composition and coking qualities of the coals selected. There are 165 Koppers ovens, in three batteries; and, carbonizing on 16½ hours' coking time, there is a daily capacity of 3000 tons of coal, yielding about 2200 tons of coke, 16½ million c.ft. of surplus gas of 610 B.Th.U. quality, 75,000 lbs. of sulphate of ammonia, 24,000 gallons of tar, and 10,000 gallons of light oil.

The bye-product ovens of the Philadelphia Suburban Gas and Electric Company, at Chester, are dealt with by Mr. J. D. Shattuck, who explains that the success of the plant depended upon an adjoining blast-furnace, which, however, failed; and the plant remained idle for several years. The method of heating the original ovens was to burn in the combustion flues part of the gas obtained from distilling the coal; and to get this gas, a double hydraulic main was used—the rich gas being taken from the ovens during from six to ten hours of carbonization. The balance of the gas, after passing through the benzol plant, was used to heat the ovens. The benzol thus recovered was then introduced into the rich gas. Ultimately, Mr. Shattuck, in conjunction with a Semet-Solvay engineer (this firm having put up the oven installation), conceived the plan of installing an outside producer plant, using producer gas for heating the flues of the ovens, and thereby recovering more gas per ton of coal carbonized. A higher grade of coal was obtained, which would give a good foundry coke; and ten ovens were put in operation. The producers are four in number, equipped with waste-heat boilers. When the producers are all in operation, and apart from severe weather, they, along with the boilers on the main waste-heat flue of the ovens, furnish the whole of the steam required by the plant. The coke-oven flues have at various times been fired with producer gas alone, with oven gas alone, with producer and oven gas mixed, and with tar injected into the flues. There has thus been developed a considerable choice of fuels, according to the gas needs, the cost of producer fuel, &c. As to coke-ovens generally, the author points out that plants cannot be started-up and shut-down without entailing a great expense. A plant that is shut-down has to be in a great many respects dismantled. The ovens have to be carefully boarded-up, and made waterproof, so that they will not disintegrate; and after considerable shut-down periods, large renewals of tanks and water, liquor, and steam pipes must be made. When deciding whether to instal coke-ovens, the first consideration is whether there is some promise of a good and steady market for coke; and this being determined, great care must then be exercised to find out if a suitable coal can be found which will produce the quality of coke that will be saleable at all times. To start a plant up without the special coal for which the plant is adapted is almost suicidal. Careful tests and analyses of coal are most important features.

Among the fundamental requirements which brought about the construction of the bye-product coke plant of the Minnesota Bye-Product Coke Company at St. Paul, was that of producing gas of a quality and in a quantity which would serve the needs of the St. Paul Gas Light Company. Added to this requirement of gas for domestic purposes, was the market for a smokeless fuel which could compete with anthracite coal. There are 65 Koppers cross-regenerative ovens (12½ tons), with a capacity of from 1100 to 1150 net tons of coal per day. The plant operates with a coal mixture of about 85 p.ct. of high volatile coal and 15 p.ct. of low volatile. The carbonizing time in the ovens is approximately 16½ hours, though the plant is capable of being operated on a coking-time as low as 15 hours. The plant is run one day a week on a special coal mixture for the purpose of producing foundry coke of the highest grade. This is attained without affecting in any way the production of gas. The gas company take from the plant up to 6 million c.ft. per day. The yields of bye-products per ton of coal are approximately: Tar, 9 gallons; sulphate of ammonia, 25 lbs.; benzol motor fuel, 3 gallons. After a year of operation, the plant has demonstrated that it can produce gas for domestic purposes, and at the same time a smokeless fuel for domestic use.

Another installation illustrated is at the works of the Republic Iron and Steel Company, at Youngstown (Ohio). The first instalment of this plant was one battery of 68 Koppers ovens of 13½ tons each, with complete bye-product recovery arrangements. Subsequently a second battery of 75 Koppers ovens of the same size was added, making in all 143 ovens. In the coal mixture, 85 p.ct. is high volatile; and the coking time is approximately 16 hours, which gives a carbonizing capacity of 19½ tons of coal per oven per day, or a total of 2800 tons daily. The resulting products are approximately: 1900 tons of furnace coke, 140 tons of breeze, 61,000 lbs. of sulphate of ammonia, 25,200 gallons of tar, 16,000,000 c.ft. of surplus gas, and 8000 gallons of benzol products. After the gas has been freed from its bye-products, it passes to a holder on the plant. Thence about 40 to 45 p.ct. of the gas goes direct to the bye-product coke-ovens, to furnish the necessary fuel for carbonizing the coal. The remainder of the gas—the "surplus gas"—is used in the heating furnaces and open hearth plant of the Steel Company.

There is an article advocating the metering of coke-oven gas; and in this the writer says that, in his visits to some of the very large steel-works of the country, he has observed a meter of the rotary type, which the operators stated gives satisfactory service. In one of these plants a large number of meters of this description were employed—several of a size measuring upwards of 700,000 c.ft. per hour, and operated in a single unit. Some of these meters had already been in service a period of about ten years.

Mr. W. H. Blauvelt writes on the subject of the relation of bye-products to chemical industries; and there is an article on washing light oil fractions from coke-oven gas, by Mr. F. D. Schreiber, to which reference may again be made later on in our columns.

Nottingham and the Calorific Standard.—An application has been received by the Local Government Board from the Nottingham Town Council for an Order under the Gas (Standard of Calorific Power) Act, 1916. The standard power proposed is 500 B.Th.U.

Gas-Works in Poland.—The "Journal für Gasbeleuchtung" of Dec. 21 last stated that a brochure issued by the Polish Technical Association contains statistics by M. Swierczewski, of Warsaw, on the gas-works of Poland. There are only seven gas-works for the 120 cities and towns in the kingdom of Poland, as against over 1600 gas-works for the 3000 odd cities and towns of Germany. In Warsaw and Lodz the increase in gas consumption was very rapid, notwithstanding the competition of electricity, up to 1914. M. Swierczewski, in conjunction with M. Hordliczka, the manager of the Lodz Gas-Works, has founded a Company, with a capital of about £100,000, to undertake the erection and operation of gas-works in other Polish towns, and dealing in bye-products. He urges the Warsaw Technical Association to support vigorously a campaign for the provision of gas-works in most of the towns in Poland.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

THE following is the report of the Directors of the Gas Light and Coke Company for the year ended Dec. 31, which, with the accounts [some figures from which are given below], will be presented at the ordinary general meeting next Friday.

The Directors regret to have to report that Mr. John Miles has resigned the Governorship of the Company—an office which he has held since May, 1916. They are pleased, however, to announce that he still remains a Director.

The Directors have elected Mr. David Milne Watson, who since May, 1916, has been Managing Director of the Company, and will still retain that position, to succeed Mr. John Miles as Governor.

The Company, in conjunction with many other gas undertakings, has, as has been reported from time to time, suffered from the enormous advance in prices of raw materials and the rise in wages. The effect on the Company, working as it does under a sliding-scale, was to reduce the dividend to a point which seriously affected the Company's position. The matter was brought before the Government; and after certain negotiations had taken place, a Bill was deposited by the Company seeking statutory relief. In the end, the Government themselves introduced a Bill entitled the Statutory Undertakings (Temporary Increase of Charges) Bill, 1918, which, as originally drafted, would have allowed in the Company's case a dividend of 2 p.ct. upon the ordinary stock. Eventually the Bill was amended in the House of Commons, and permitted a payment of three-quarters of the standard rate of dividend on the ordinary stock of the Company—viz., 3 p.ct.

In accordance with this enactment, the Board of Trade has now made an order authorizing the Company to pay a dividend on the ordinary stock for the half year ending on the 31st of December, 1918, at a rate not exceeding 3 p.ct. per annum.

The dividend on the 3½ p.ct. maximum stock for the half year ending the 31st of December, 1918, owing to the rise in the price of gas to 4s. 4d., is reduced to £2 13s. 4d. p.ct. per annum.

The accounts for the year show that, after payment of a dividend of £2 18s. 8d. p.ct. per annum on the ordinary stock for the June half year, and after providing for fixed charges, there is a total available balance of £625,228 13s. 6d., out of which the Directors recommend the payment of a dividend on the ordinary stock for the December half year at the rate of 3 p.ct. per annum, which will absorb £244,484 12s. 6d., and leave £380,744 1s. to be carried forward to the credit of the current year.

The sale of gas for the year shows a decrease of 7 p.ct. compared with the quantity sold during 1917. This decrease is mainly accounted for by the Gas Rationing Orders.

Notwithstanding a decrease during the year of 3966 in the number of consumers, there has been an increase of 4811 in the number of gas-stoves sold and let on hire.

The Directors regret that they had to raise the price of gas to 4s. 4d. since the last report was presented to the shareholders.

The Bill which was deposited in Parliament with the object of amending the statutory provisions which applied to the sliding-scale of dividends, and of obtaining powers with regard to the issue of loan capital, was modified in its passage through Parliament; the clauses referring to the sliding-scale being dropped, in view of the promotion by the Government of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. The Company's Bill, so far as concerned powers with regard to the issue of loan capital, after undergoing some amendments, eventually received the Royal Assent.

The Directors appointed Mr. William Lyle Galbraith as Secretary, in the place of Mr. W. Beckford Long, deceased.

The number of the Company's employees who have served with the Colours is close upon 5000, of whom 57 are known to have been awarded distinctions, and 74 to have obtained Commissions. The Directors deeply deplore the casualties among these gallant sailors and soldiers, of whom nearly 500 are known to have been killed or to have died on active service.

DAVID MILNE WATSON, *Governor.*

Horseferry Road, Westminster, S.W.1,
Jan. 21, 1919.

The Accounts.

The accounts consist of the usual statements.

The statement of capital (stock) sets forth that the total paid-up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £285,225, the total amount of the Company's existing capital powers is £22,961,210. The statement of loan capital stands thus: Total paid up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,958 to the amount of £29,455,017. The expenditure is shown in the following items:

Expenditure to Dec. 31, 1917		£14,779,894 16 2
Expenditure during the year to Dec. 31, 1918—viz.:		
Buildings and machinery in extension of works	£10,159 10 8	
New and additional mains and service-pipes	4,523 15 5	
		14,683 6 1
		£14,794,578 2 3
By amount written off plant	£108,443 15 4	
„ mains thrown out of use	7,355 3 0	
„ meters returned from hire	11,664 3 3	
„ stoves do.	15,264 4 2	
„ depreciation of meters and stoves	129,876 0 0	
		272,603 5 9
Total expenditure		£14,521,974 16 6
Nominal amount added on conversion		14,451,145 0 0
		£28,973,119 16 6
Deduct amount of capital redeemed under Company's Act of 1903		285,225 0 0
		£28,687,894 16 6
Balance of capital account		767,122 18 2
		£29,455,017 14 8

The total of the net revenue account is £1,301,143. The following statement shows how it is proposed to appropriate it:

Year, 1917.			
£153,246	..	Interest on debenture stocks and bonds for the year	£153,245 10 0
162,489	..	Dividend on the 4 p.ct. consolidated preference stock for the year, £162,489 8s.	
91,000	..	Dividend on the 3½ p.ct. maximum stock for the year, £89,166 13s. 4d.	242,656 1 4
253,489			
68,013	..	Cost of writing down sundry investments.	
46,112	..	Interest on temporary loans and sundry funds, *less* credits	40,961 7 6
(£3 14s. 8d. p.ct.) 304,517		Dividend on the ordinary stock June half year, 1918 (£2 18s. 8d. p.ct.)	239,051 12 8
555,292	..	Balance applicable to dividend on ordinary stock December half year, 1918	625,228 13 6
£1,380,689			£1,301,143 5 0

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Reserve fund, £82,934 special purposes fund, £352,251; depreciation fund, £91,481.

The revenue account appears on the opposite page.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £434,839; gas oil, £286,266; coke, £48,960; tar and ammoniacal liquor and products, £131,356; and sundries, £601,679. The figures this time last year were: Coal, £369,204; gas oil, £131,687; coke, £76,866; tar, ammoniacal liquor, and products, £121,857; sundries, £489,784.

Statement of Coal.

—	In Store Dec. 31, 1917.	Received During Year.	Carbonized During Year.	Used During Year.	In Store Dec. 31, 1918.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	241,606	1,859,670	1,861,903*	3261	236,112

* In addition to this quantity of coal, 5,750,032 gallons of oil have been used during the year.

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.			
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Accounted for.	Number of Public Lamps.
	Thousands.	Thousands.	Thousands.	
* 29,210,083	569,528	25,849,218	26,866,835	44,524
† 31,480,511	514,371	27,858,484	28,829,491	44,552

* Including 6,955,584,000 c.ft. of carburetted, &c., water gas. † Year 1917.

Statement of Residual Products.

Description.	In Store Dec. 31, 1917.	Made During Year.	Used During Year.	Sold During Year.	In Store, Dec. 31, 1918.
Coke—tons	61,247	1,130,759	207,358	953,381	31,267
Breeze—tons	104,625	261,951	45,812	180,097	140,667
Tar, from coal only—galls.	1,638,833	17,362,595	17,117,392	..	1,884,036
Ammoniacal liquor—butts	31,742	514,509	518,189	..	28,062

GASLIGHT AND COKE COMPANY.—REVENUE ACCOUNT.

Expenditure.

Year, 1917.		£ s. d.	£ s. d.
£2,967,776	Manufacture of gas— Coal, including all expenses thereon	3,154,672 3 2	
318,896	Oil ,, less value of oil tar	277,755 11 2	
186,316	Coke, &c., used in the manufacture of carburetted water gas	240,922 3 4	
32,672	Salaries of engineers and other officers at works	35,027 4 6	
317,238	Wages	396,098 15 2	
33,562	Purification	55,298 9 10	
707,266	Repair and maintenance of works and plant, materials and labour, less received for old materials, £11,929 5s.	862,181 11 3	
	Distribution of gas—		5,022,035 18 5
146,940	Salaries and wages of officers (including rental clerks)	180,907 14 2	
218,332	Repair and maintenance of mains and service-pipes, &c.	224,903 9 1	
180,209	Repair and renewal of meters	248,963 11 1	
200,546	,, ,, stoves	206,157 14 10	
12,424	Fitting up automatic meter supplies	9,862 1 10	
			870,795 1 0
61,153	Public lamps—lighting and repairing	..	71,341 7 6
	Rents, rates, and taxes—		
15,177	Rents payable	15,344 8 8	
362,582	Rates and taxes	409,248 7 10	
			424,592 16 6
	Management—		
7,500	Directors' allowance	7,500 0 0	
604	Company's Auditors and Assistant	604 4 0	
19 934	Salaries of Secretary, Accountant, and clerks	23,386 6 5	
77,556	Collectors and cashiers	90,944 8 1	
11,585	Stationery and printing	17,604 2 8	
16,247	General charges	19,432 3 0	
			159,471 4 2
2,440	Co-partnership	..	42,000 0 0
600	Parliamentary charges	..	1,461 6 9
5,607	Law charges	..	1,634 2 0
8,275	Bad debts	..	6,827 7 6
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
53,052	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	55,705 7 0
17,830	Allowances to employees on active service	..	16,614 1 0
4,709	Workmen's compensation	..	7,476 12 8
8,852	Company's Contribution under National Insurance Act, 1911	..	8,559 4 3
	Public officers—		
2,105	Gas Referees and Official Auditor	2,104 5 0	
985	Public testing-stations	1,126 9 4	
			3,230 14 4
6,000,370			6,690,745 3 1
1,029,180	Balance carried to net revenue account		1,050,098 19 3
7,029,550			7,740,844 2 4

Total Wages Paid, 1918 £1,862,194 8 4 — Total Salaries Paid 1918. £221,511 4 8
19 7 £1,524,536 7 11 — 1917. £204,314 13 5
1913 £1,064,079 4 3 — 1913. £190,65 16 8

Revenue.

Year, 1917.		£ s. d.	£ s. d.
	Sale of gas—		
£4,376,380	Per meter at 3s. 10d., 3s. 7d., 4s. 4d., and 4s. per 1000 cubic feet.	5,198,771 12 8	
98,434	Public lighting and under contracts	105,863 10 3	
4,474,814			5,304,635 2 11
159,268	Rental of meters	..	160,542 0 5
179,817	Rental of stoves	..	185,278 6 11
203,430	Rental of fittings	..	150,717 6 10
	Residual products—		
1,295.859	Coke, less labour, &c.	1,272,740 2 5	
39,478	Breeze, less ,, ,,	41,284 13 1	
347,963	Tar and tar products	358,831 16 3	
313,759	Ammoniacal liquor and sulphate of ammonia	249,658 3 6	
1,997.059			1,923,114 15 3
14,673	Rents receivable		16,114 7 6
489	Transfer fees		442 2 6
7,029,550			7,740,844 2 4

Temporary Increase of Charges Act.—The Winsford Urban District Council have made application to the Local Government Board for an Order under the Statutory Undertakings (Temporary Increase of Charges) Act.

Small Coke aad Oil-Gas Tar for Briquettes.—The "Journal für Gasbeleuchtung" says that the idea of briquetting coke is not new; but until recently no determined effort to achieve success has been made. The largest surface is given by the egg form, so that this is the most suitable for coke dust. To favour ignition, an addition of coal-dust has been tried; but the results have not been satisfactory. Another disadvantage of coke is its porosity. Water is held in the pores, and this, converted into steam in the furnace, blows the block to pieces. Hence it is necessary to use a binder which when applied is sufficiently fluid to penetrate and fill the pores. This seems to exclude everything but pitch. But pitch is not a very cheap material; and the nature of coke requires a considerable proportion of the binder. As a substitute for a portion of the pitch, oil-gas tar has been found suitable. This material so applied has been patented under the name of "Koxite." The binder consists of 5 p.ct. pitch and from 0·8 to 1 p.ct. of the fluid material. These egg-shape briquettes are of small dimensions, weighing only from 35 to 45 grams. The incorporation of a certain percentage of coal-dust improves their appearance, and adds somewhat to their strength.

DURABILITY OF INTERMITTENT VERTICAL RETORTS.

3000 Working-Days Reported from Marlendorf.

AN article by Dr. R. Geipert, an engineer once on the Berlin staff of the Imperial Continental Gas Association, in the "Journal für Gasbeleuchtung" of Dec. 28, records the work accomplished with six paired-settings each of twelve intermittent vertical retorts 16 ft. 6 in. in length, which started work at Mariendorf (Berlin) on Sept. 8, 1909. It is therefore 3400 days from that date to the close of last year.

In this period, the settings have been let down-four times, for an aggregate of 400 days, including the time of cooling-off and heating-up again. They have thus been in full working for 3000 days. The retorts, Dr. Geipert says, are still in use and behaving quite well. They are sound, and giving the same duty as the other vertical retorts on the same works; while in most cases the block of coke drops out readily. The prolonged durability of these settings is accounted for chiefly by the careful supervision of the heats and regulation of the temperatures of the walls of the retorts. The foremen are skilled in detecting the proper temperatures by eye; and the regulation is not difficult. So long as the retorts are charged and steamed for the same periods, the heat required by the settings remains the same, and the secondary air and flue dampers are left untouched, and the primary air is frequently regulated in order to maintain the proper composition of the flue gases. The heats are altered when necessary by varying the flue and secondary air dampers; while special arrangements are provided for securing the correct distribution of temperature in each setting.

As with all other settings, it has been necessary to keep these retorts in proper order. Many leaks and obstructions have been cured. For instance, leakage in the producer gas distributing channel lets in air by which the gas is prematurely burned, giving a short intensely hot flame which overheats the adjacent portions of the retorts. The producer grates must be clinkered at the proper time, and especially must leakage at the bottom doors of the retorts be avoided, as flames there will in time distort the framework by which the retorts are supported. When these retorts were let-down in the summer time, as already mentioned, they were thoroughly overhauled. The producer walls were relined at the bottom where damaged by fluxed clinker; the regenerator flues were cleaned and made sound; and the walls of the retorts were made tight, and inside excrescences chipped off. Only four retorts have needed patching with fresh material. Some bottom mouthpieces which cracked have been renewed—at times while the settings were in use. The repairs, &c., have throughout been within very moderate limits.

VILLAGE GAS-WORKS.

By C. B. TULLY, of Kings Cliffe, Northants.

THE year 1918 has been, thanks to war conditions, a disastrous year for many gas undertakings, and for many small undertakings the conditions have caused either their closing-down altogether or their being run at a considerable loss. To many, conversant with the economics of practical gas manufacture, the results of the past year were a foregone conclusion; for with ever-increasing restrictions, shortage of labour, decreased coal stocks of the country, and increasing cost of all commodities of all kinds, very abnormal conditions were certain to prevail. The possibility of these conditions led, some two years ago, to the taking-over of the Kings Cliffe works for the purpose of testing on a practical scale the supplying of a comparatively low-grade gas— *i.e.*, 350 to 400 B.Th.U.

A plant was, therefore, installed to produce such a gas from non-caking house or other hard coal in such a manner as to completely gasify the fuel, and so produce the maximum quality of gas from a minimum of coal, and avoid the necessity of marketing residuals. The gas previously supplied was of 600 B.Th.U., and it was consequently anticipated that there would be some difficulty in converting the consumers to the use of a gas of 350 to 400 B.Th.U. There was, however, no difficulty—in fact, the results have been most satisfactory. The new gas was turned on; the burners and fittings being adjusted to suit it by simply closing-up the air supply, and opening slightly the gas nipples. Flat-flame burners were, of course, replaced by small incandescent lights. Gas-engines required no alteration whatever; it being sufficient to open the gas-cock more fully. The gas is regular in quality, and even more satisfactory than ordinary coal gas, as the incandescent lights can be turned down as desired, and no lighting-back takes place. For gas cookers, the air supply is done away with altogether, and the gas used straight as in a luminous flame stove, enabling it to be regulated better and more economically than with the bunsen burner.

Small upright incandescent burners have been made without an air supply, to take the No. 0 and No. 1 mantles for lighting bedrooms, passages, bath rooms, &c.—burning 1 to 2 c.ft. an hour, or capable of being turned down to ½ c.ft. when desired. These burners are more economical, and far more satisfactory, than a flat-flame burner. They cost about 1s. each.

Two No. 1 mantles have been in use for nearly two years, and

one only has just been renewed. A flat-flame burner consuming a similar quantity of gas would give no light whatever. Inverted burners of all sizes have proved most satisfactory; but the upright burner is not quite so efficient as the inverted. It is, however, fairly satisfactory.

The plant consists of a small generator, wash-box, vertical steam-boiler, and engine-blower. The gas from the wash-box passes direct to the existing plant through the foul main, condensers, scrubber, oxide purifiers, and meter, into the gasholder, of which there is only one.

A youth of 16 has charge of the whole plant. He starts work at 8 a.m.; clinkers the generator; fills it with coal; and starts making gas at 9 a.m. The holder is sometimes full-up by dinner time; if not, he works on until it is full. He then closes-down, and goes away until next morning. He works on Saturday evening, fills up the holder for Sunday, and starts work again on Monday morning. The plant makes 2000 c.ft. per hour, and produces 40,000 c.ft. of 400 B.Th.U. gas per ton of coal carbonized. With a bigger output, this make of gas per ton would be considerably increased.

The plant was installed to prove definitely the possibilities of a low-grade gas for distribution on practical lines; and it has undoubtedly satisfied all requirements. The gas is being used for a number of manufacturing operations, and fills all requirements with more economy, satisfaction, and simplicity than ordinary coal gas. Coal, coke, a mixture of coal and coke, or coal, coke, and turf or peat can be satisfactorily used in the plant.

A large number of these plants are in use in this country and on the Continent, in conjunction with coal-gas plants; but only three towns are using it alone—viz., Bandon, Birr, and Kings Cliffe—although some of the other plants are being used to the extent of 50 to 75 p.ct. of the make.

There is little doubt that such a plant as this will save the situation for small gas companies, and enable them to carry on with profit to themselves and with economy and satisfaction to their consumers.

DUTCH ASSOCIATION OF GAS ENGINEERS.

Annual General Meeting.

(*Concluded from p.* 172.)

COAL GAS AS FUEL FOR MOTOR VEHICLES.

The question of the applicability of coal gas as a fuel for motor vehicles during the prevailing scarcity of petrol was dealt with first by Heer J. Ph. Bruinwold Riedel, of Utrecht, who said that the motor-car used by the Fuel Committee of his town now ran on coal gas. Two iron storage vessels were placed on the roof of the car (the framing of which was strengthened), and were charged with coal gas compressed to 10 atmospheres, as supplied for railway carriage lighting; and the car could make journeys of about 12½ miles on each filling of the containers. Cylinders, as used for compressed oxygen, had also been tried on the step-board of the car, charged with coal gas to 125 atmospheres. The car ran as well on coal gas as on petrol. The Municipality had also a motor vehicle, with a pump driven from the engine, which went round pumping out cess-pits. This vehicle now used compressed coal gas when travelling; but as the stored gas would not suffice for much pumping, arrangements had been made to couple-up the engine direct to the gas-mains through a house-service or public lamp connection near each pit, and in this way to take a supply of gas for pumping. As soon as the pumping at one place was finished, the vehicle used its store of compressed gas for travelling to the next pit. In order to make coal gas generally available for motor-vehicles, the various small gas-works would have to provide a large reservoir in which gas would be stored at 10 to 15 atmospheres pressure, and motor-vehicles would replenish their storage cylinders direct from this reservoir in a few minutes.

Heer M. Levert (Apeldoorn) said that a horse-drawn tramcar in his neighbourhood had been converted to petrol propelled. When petrol became scarce, one of the compartments of the car had been equipped with a gas-bag of about 175 c.ft. capacity; and the car had since run quite satisfactorily on coal gas. But he thought the Coal Distribution Department had not allotted a ration of gas to the tramway.

Heer J. J. C. Willekens (Eindhoven) said that a local glass-works had equipped a 5-ton motor lorry with a gas-bag, placed in a rectangular frame over the driver, and were using it regularly for carrying glass from the works to a store and from the store to the railway and wharf. The gas-bag held only about enough gas for an out-and-home journey, and was then refilled through a 3-in. hose. The gas had proved even more satisfactory than petrol; and it was doubtful if the owners would revert to petrol when it was again obtainable.

The Chairman said that, to his knowledge, gas was being used in quite small towns, such as Axel in Dutch Flanders, for motor-vehicles, as well as in the cities.

AMMONIA PRODUCTS.

A question as to the manufacture of sal-ammoniac by Dutch gas-works was passed over, owing to the absence of Heer Meyer Cluwen, who had had experience of it at Arnheim, which, so far as transpired, was the only place in Holland where its manufacture was carried on.

Heer J. Ph. Bruinwold Riedel (Utrecht) said that, at the price fixed by the Fertilizers' Commission for sulphate of ammonia, it was more advantageous to gas-works to sell their liquor to manufacturers of liquor ammoniæ than to work it up to sulphate. The Fertilizers' Commission had refused any concession to gas-works in regard to the price fixed for sulphate; and the only way gas-works could force the hands of the Commission was to sell their liquor for other purposes, from which a higher return was obtainable. Heer J. A. A. Ochtman (Haarlem) thought the Industries' Commission might help in the matter, as it was chiefly important from the national standpoint that the ammonia should be utilized in the country. The Chairman said that some ammonia had been sold by the Amsterdam Gas-Works for explosives' manufacture—a better price being obtained than through the sale of sulphate. Heer A. van der Stel (Schoten) said that he had found it better to cease manufacturing sulphate, and to sell his liquor to the Haarlem Gas-Works, where it was used for other purposes.

SUNDAY REST ON GAS-WORKS.

Heer J. S. Theunissen (Rijssen) raised the question of the practicability of complete cessation of Sunday work on gas-works. The gas-works in his town had been erected by a Company in 1914, subject to a condition imposed by the Local Authority that the whole of the gas supplied should be produced on week days only. The Company had provided a large gasholder, capable of storing 360 p.ct. of the maximum daily consumption of gas, and by this means had fulfilled the condition. On July 1, 1917, the works were transferred to the Municipality; and he was put in charge of them. He was required to stop manufacture from midnight on Saturday to midnight on Sunday. He found it necessary, however, to replenish the producer fires on the Sunday, both in order to prevent damage to the material of the settings and to have adequate heats for starting-up on Monday. He had explained this to the four members of his Gas Committee, three of whom were satisfied; but one was unconvinced, and had asked him to bring the matter up for discussion at this meeting of gas managers.

The Chairman inquired if any members knew of works in which absolute Sunday rest prevailed. Heer Ferkranus (Dokkum) said in his works there was no Sunday labour, except that the fires were made up twice only. Heer J. Ph. Bruinwold Riedel pointed out that complete Sunday rest was uneconomical of fuel, and the State Coal Distribution Department might object to it. Heer P. Hijdelaar (Zeist) inquired if Sunday rest referred to the manager as well as the men. If it did, it seemed to him quite impossible to have absolute Sunday rest on a gas-works. Cases were mentioned by other members of the lighting of public lamps (which, however, was done automatically at Rijssen) and of maintaining steam for preventing the freezing of gasholder cups in winter time. Finally, the meeting agreed that, generally speaking, absolute Sunday rest on gas-works was impossible.

COAL SUPPLY.

An informal discussion was opened by Heer C. Haasters (Utrecht) on the question of the supply of more coal by Germany to Holland, and its immediate distribution to gas-works. He had learnt through the Commercial Branch of the German Legation that Germany was prepared to deliver more coal, without, as was alleged in "De Telegraaf," requiring any foodstuffs to be sent in exchange; and he proposed that members should take steps to procure this coal. The Chairman and other members expressed the view that negotiations for deliveries of German coal were a matter of foreign politics, which must be left to the State Departments. Heer Th. Ferkranus suggested that gas managers would do best to encourage by all means in their power the development of the coal mines of Dutch Limburg, in order that as soon as possible Holland might become independent of foreign coal. They should try to utilize Dutch coal, to the utmost, for gas making. His speech was received with prolonged and hearty applause.

THE SUPPLY OF FIRE-BRICKS.

A question was raised by Heer A. van der Stel (Schoten) as to the supply of fire-bricks from abroad, and he was assured that some supplies were certain from Belgium (though not necessarily from St. Ghislain) and perhaps also from Germany. It appeared, in the course of a long discussion, that St. Ghislain material had been specified in contracts for the renewal of settings.

After some reference to the supply of gas to central kitchens, and its relation to fuel rationing, the sitting closed with a vote of thanks, proposed by Heer P. Bolsius (Bois-le-Duc) to Dr. Terneden for presiding over the meeting.

In the afternoon members visited the Groningen Gas-Works, where they were received by the local Gas Committee and the Engineer, Heer D. A. Payens.

The Berne correspondent of the "Morning Post" says that German chemical and dye works are being rapidly re-adapted for the manufacture of peaceable products; and the future is regarded as by no means unpromising. Manufacturers realize that they will not be able for some time to come to export 70 to 75 p.ct. of their total output; but they are already resuming the production of dyes from coal tar, and the manufacture of pharmaceutical products has been carried on at full pressure throughout the war.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT).

Visit to the Castlecary Brick-Works.

There was a very enjoyable visit to the Castlecary Brick-Works of Messrs. John G. Stein & Co., Ltd., last Saturday week, at which about fifty members were present. Mr. John G. Stein and three of his assistants conducted the party round. The works were commenced in 1902, and were laid out on entirely modern lines, the plant being of up-to-date design. The works are very conveniently situated between the North British and Caledonian Railways, and are in close proximity to the Forth and Clyde Canal. Owing to the splendid field of raw materials, including fire-clay, ganister, and silica rock, the works are entirely self-supporting. With the extensions made since 1902, the works are now one of the largest in Europe.

The seam of clay was opened by means of a pit 60 fathoms deep, and in connection with this pit a substantial steel gangway has been erected. On being brought to the surface, the clay is mixed, and, having been mixed with a certain percentage of milk of lime, is distributed by means of buckets on a mono-rail system to various parts of the works for brick-making. The bricks are both machine and hand made. There are two drying stoves, running parallel, each 1000 ft. long—the one for fire-clay being 50 ft. wide and the other for silica being 60 ft. wide. After being moulded, the bricks are dried on the floor, which is heated from underneath by means of the exhaust steam from the winding engines. On the fire-clay side there is a range of 53 continuous kilns, and on the silica side various other types of kilns for the silica and specials. The works are equipped with joiners', blacksmiths', and fitting-shops, where all repairs are carried out. Electric lighting is used throughout, and is generated on the premises. The firm have erected a number of cottages on the main road for their employees.

After inspecting the works, the party adjourned to the offices, where they were entertained to tea by Mr. Stein. The President (Mr. T. G. Moffat), in the name of the Association, thanked the Company for the interesting visit they had had that afternoon, and for the kind hospitality extended to them. Mr. Stein, in reply, said it had been a source of pleasure to them to entertain the Association; and he hoped that in the future they would again visit Castlecary. Half-an-hour was passed till train time with song and story.

"SAFETY FIRST" ASSOCIATION.

With the object of advocating and facilitating the formation in each industry, as well as in each firm in such industry, of a "Safety First" Committee, comprising representatives of employers and employees, to investigate the causes of accidents peculiar to the individual industry, and to discover and apply effective measures of prevention, the British Industrial "Safety First" Association has been formed—with the Right Hon. Lord Leverhulme as President. Other objects are to conduct an intensive educational "Safety First" campaign among employers and workpeople; to give the widest publicity to accident prevention methods; to organize meetings and conferences, and offer awards for merit, in connection with the subject; and to engage in other forms of propaganda. In short, the mission of the Association (to use their own words) is to render the industrial community "wreckless, not reckless." Employers, industrial organizations, and trade unions are invited to join; and to this end, it may be mentioned that the temporary offices of the Association are at No. 31, Westminster Broadway, S.W. 1. The "Safety First" campaign has already done much; but more still remains to be accomplished. As evidence of the necessity which exists for immediate action, the latest published returns show that, in 1914, 969 persons were killed, and 147,045 were injured, by accidents in workshops and factories alone, a large proportion of which would, no doubt, have been prevented had those who became casualties been educated in matters pertaining to their own safety. Many of the largest firms and trade unions in the country are actively supporting the movement; and it is hoped to proceed at once with the preparation of "Safety" notices and literature specially suited for individual industries, which will be supplied free to the firms that become members of the Association.

Percentage of Ash in Coke.—In reference to the letter of Mr. John Hughes, F.I.C. [*ante* p. 115] to the "Iron and Coal Trades Review," drawing attention to the great differences frequently shown in figures of ash reported by different analysts in respect of duplicate samples of coke, Mr. T. G. Watts, B.Sc., writes to the same paper, advancing an explanation resulting from his own experience. He found the cause of a very large difference in one case to be due to the use by the buyer's chemist of a soft iron hammer for breaking the lumps, an iron pestle and mortar, and a soft iron crushing plate. Treating a sample of the coke with a steel hammer and a porcelain mortar, and then determining the ash content, there was found 5·8 p. ct., where previously the figure had been 12 p. ct.

GAS AND STEAM POWER COSTS COMPARED.

A few months ago, at a meeting of the South Wales Institute of Engineers, some notes were read by Mr. T. M. Hunter, M.A. B.Sc., Assoc.M.Inst.C.E., on "Gas Firing Boilers;" and an abstract of the paper appeared in the "JOURNAL" for Oct. 22, p. 185. At the time of presentation, several members spoke on the paper; and the discussion was adjourned until the November meeting, the official report of the proceedings at which is now to hand.

The PRESIDENT (Mr. J. F. Tallis) said they knew there had existed—and they still found it—considerable suspicion or prejudice with regard to the use of gas-engines; but he believed this was being dissipated, and that there was a great future for the gas-engine. It was much easier to transmit gas than steam; and it seemed to him a preferable proposition to use their waste gas direct in the engine, than to consume it under the boiler.

Mr. W. D. WIGHT said though the idea of applying gas under the boiler was an old one, yet it had not been generally adopted. The idea, no doubt, was good—like that of using the gas direct in the gas-engine; but inherent difficulties had retarded its more general application. If, however, the suggestions contained in the paper were in practical operation—as he assumed they were—there was a great future for the method of generating steam by gas-fires; and as gas-producers were in common use, they should help it along. The President had concurred in the opinion that very much better results were obtainable by using gas in a gas-engine than by burning it under boilers; but he (Mr. Wight) rather demurred to the suggestion that substantial improvements had been effected in this respect. There were still troubles connected with the use of gas in gas-engines which more than counterbalanced its great ecenomy; and as the paper showed that important advances had been made in the method of burning gas under boilers, he was inclined to think there were greater prospects in this direction. The steam-engine, in whatever form it might be used, had seen great improvements—in steam-turbines, uniflow engines, and so on—and it was always reliable.

Mr. T. SUGDEN said no doubt, in theory, gas used direct in a gas-engine was likely to give more economy; but, as Mr. Wight had remarked, there were practical difficulties in the way. As a matter of fact, there were electrical power stations where gas-engines had been given a long trial, which were going back to steam in the shape of turbines. It was the practical difficulties in the way that made what looked like a profitable theory unprofitable. The gas-engine had a long way to go before it displaced the steam-turbine. He had no doubt gas would be used more than it had been in connection with steam-boilers. It was clean and easy to work, while it dispensed with a lot of labour. He thought something might be done in the direction of gas-fired boilers after taking the bye-products from the coal and working through the mains at very high pressure. This, it seemed to him, was the direction in which the development of steam power would go in the very near future; but he did not think the use of gas direct in the gas-engine would immediately prove a profitable business, whatever it might be in the future.

Mr. W. A. CHAMEN said nothing had been more disappointing in one's experience than the large gas-engine. Some years ago it was thought that, for the economical production of electricity, steam-engines would ultimately be superseded by gas-engines; but, in spite of everything that had been done by designers in improving the gas-engine—and a great deal had been done—they were still without a satisfactory gas-engine on a large scale. He did not know whether to draw the line at from 300 to 400 H.P., or larger; but when they came to the wholesale generation of electricity, using (say) 10,000 H.P., or even 5000 H.P., he did not find a gas-engine of this horse power at work. He was aware there were special cases where, in spite of the the expense of maintenance of the gas-engine, it had been found economical to put one in. He referred to chemical works and to coke-ovens—places where waste gases could be utilized; but even here he failed to see signs of an increased employment of gas-engines. The gas-engine seemed to reach a certain stage of development, and there stop; and he had arrived at the conclusion that, unless some radical departure took place, they must give it up as a means of generating electricity on a large scale. There were, no doubt, cases where small plants up to 250 or 500 H.P., and then perhaps not in one unit, were working satisfactorily; but the cleaning and maintenance cost seemed to greatly exceed that of steam—at any rate, of the steam-turbine. He agreed that they must look to the better utilization of the heat that was in the fuel, in the furnace, and the economical use of gas under boilers, rather than to gas-engines.

Mr. EDGAR C. EVANS said that as far as coke-oven gas was concerned, there was some misconception as to the amount actually available for use outside the requirements of the coke-oven plant. As a general rule, it was estimated that 50 p.ct. of the gas produced in a coke-oven installation was available for outside purposes. This was certainly an exaggeration. If the steam and power required by the coke-oven plant itself were deducted, it would be found that there would be very little more than 20 p.ct. available for power production for outside purposes. It was, however, undoubtedly the case that a rich gas of this nature offered better advantages for gas firing than a low-grade gas like producer gas or blast-furnace gas; and as gas-fired boilers improved, there would not be the efficiency losses with coke-oven gas that the advocates of gas-engines were so insistent on. Taking everything into consideration, he thought that the utilization of coke-oven gas for gas firing offered advantages over its use in gas-engines. With producer gas, the relative advantages of gas-engines and gas-firing were much more controversial. Some time ago he had occasion to investigate a scheme which involved the gasification of sufficient coal to give the equivalent in B.Th.U. of something like 300 tons per day. It was found at the outset that approximately 500 tons per day would have to be gasified to produce the required results; while even with ammonia recovery, the costs were far greater than would have

been the case if the plant were coal fired. The complete gasification of coal in producers with ammonia recovery, and the subsequent utilization of the gas for steam raising, was a matter which had been strenuously advocated in the past by a number of engineers; but after a detailed investigation into its possibilities, he had been forced to the conclusion that it would not pay, except under certain favourable circumstances. In all calculations of this nature, the price of sulphate of ammonia was a ruling factor; and owing to the success of the Haber process of making ammonia synthetically, this would be a very problematical factor in the near future. With all the undoubted advantages of gas-firing, it would take a very great deal to oust coal as such from its predominant position as an industrial fuel.

Mr. G. D. BUDGE asked the author if he thought it would pay colliery companies to use gas-producers and convert the coal into gas for firing boilers, in view of the rapid advance in the recovery of ammonia. This part of the problem had entirely changed; and the large proportion of ammonia that could now be recovered from these producers would greatly alter old ideas on the subject.

At the November meeting,

Mr. SUGDEN said he had already spoken on the paper; but since then he had had an opportunity of going into it further. Though Mr. Hunter's paper was entirely devoted to the subject of firing steam-boilers by means of gas fuel, the question of the relative efficiency of power production by gas or steam, was not out of place. Some ten years ago this subject was very fully discussed. It was, however, opportune, after this lapse of years, that the matter should again be raised, and brought into line with the increased knowledge and experience now available. In earlier discussions it was stated that power stations, where gas-engines were installed, had, as the result of experience, invariably adopted steam power when carrying out extensions. This statement had been confirmed by subsequent experience. It was due to two main causes—namely, that a gas-engine was not as reliable as a steam-engine; and greater improvements had been made in recent years in the efficiency of steam-power plant than in gas plant. In considering this question, the source of gas supply was an important factor. In connection with coke-ovens and blast-furnaces, where a good supply of gas was always available, it constituted a very different problem to gas supply from producers specially laid down for the purpose. The conditions were naturally much more favourable, as regards gas power, when gases from coke-ovens and blast-furnaces were available; but it was by no means certain—excepting perhaps in a few isolated cases—even with the most favourable conditions of gas supply, when all the factors were duly considered, that gas power had any advantage over steam-engines, and when account was taken of the loss caused by breakdowns, the greater expense of up-keep, and capital cost. It was now possible to obtain 1 H.P. from 1 lb. of coal of fair quality, or its equivalent in gas. In view of this fact, taking into account the greater reliability of the steam-engine, it would appear that the advantage was on the side of steam power—more particularly when large engines were required. It might be of interest to refer to the Harpen Collieries on the Continent, where the output of coal was about 7,000,000 tons per annum, and the output of coke about 1,000,000 tons per annum. With a large plant of this kind, it was quite natural that the question of steam and gas power should be very fully considered; and as a result of the experiments made for the purpose, it was decided to utilize the gas by means of steam power. For convenience of reference, it might be well to reproduce figures giving the relative cost of gas and steam. The cost of producing 1200 H.P. in a gas-engine per hour worked out as follows:

Gas consumption for engine	£0 4 11½
Attendance	0 3 2½
Lubricating oil	0 0 9
Stores	0 0 6
Interest and depreciation (16 p.ct.)	0 12 5
	£1 1 10

The cost of the same power by steam-turbines worked out as follows:

Gas consumption for boilers	£0 13 2
Attendance	0 1 7
Lubricating oil	0 0 1½
Stores	0 0 0¾
Interest and depreciation (12 p.ct.)	0 5 2½
	£1 0 1½

A serious objection to the gas-engine was the large fall in efficiency when the engine was working under full load, which compared very unfavourably with the steam-engine under similar conditions of working. The following record of gas and steam plant over a period of four years would be found interesting. In this case, the steam and gas plant were of the same power, and arranged to work alternately, thus forming a duplicate power plant. Though the gas-engine showed greater economy, yet, as the result of experience, taking all factors into account—like breakdowns, up-keep, and special attention—the steam plant was found to give the best results. It might be pointed out that the best types of gas-engine and producers were installed, and also the best type of steam-power plant available at the time.

	Gas.		Steam.	
—	Kw. Hours—3,183,146.	Cost per Kw. H.	Kw. Hours—5,807,446.	Cost per Kw. H.
	£ s. d.		£ s. d.	
Coal	1954 19 2	0·147	11,087 7 5	0·458
Stores	642 2 2	0·048	450 3 0	0·018
Renewals	728 10 1	0·055	619 7 1	0·026
Sundries	38 1 2	0·003	74 9 8	0·003
Wages	1659 0 8	0·126	2792 18 7	0·116
Repairs and wages	893 17 8	0·067	1050 10 5	0·043
	£5916 10 11	0·446	£16,074 16 2	0·664

It was well known that the size of gas-engines was limited, as compared with the horse power obtainable from steam-engines. One of the chief reasons for this was the intense heat produced in large cylinders; and when a number of cylinders were connected to the same main shaft, if the piston in one of the engines should seize, owing to the high temperature, serious breakdowns would result. Seizing of this kind was a rare occurrence in connection with steam plant. Although, in theory, the gas-engine should show the most economical results, and undoubtedly did so, difficulties arose in actual working which, in the long run, more than counterbalanced any economical advantage over steam plant, owing to the greater reliability of the steam-engine. As to the question of reliability, the insurance companies had found the insurance of gas-engines an unprofitable and undesirable business. The progress made in connection with gas-engines had been more in the direction of high-speed multi-cylinder vertical gas-engines, which gave better results on the whole—more particularly in connection with blast-furnace gases—than the large low-speed horizontal gas-engines. In determining whether gas or steam plant should be used, it would be well to keep in mind the following points: The gas-engine was not so reliable as the steam-engine, and was much more costly in upkeep and repairs. A much larger space was required, for the same power developed, for gas-engines than was required for steam-turbines. In some industries steam was used for other purposes than power. In such cases steam plant was preferable. Water used for cooling the cylinders of gas-engines, which contained deposits, involved costly repairs owing to cracks developing. Failure of piston lubrication caused seizing of the pistons and serious breakdowns. Unless a very special attendant in charge of the gas-engine was available, it was a great source of anxiety owing to frequent stoppages and breakdowns.

Mr. W. O'CONNOR, F.G.S., stated that the paper was well-timed, seeing the strong probability of a greater production of gas from coal in the immediate future, and its possible use for the production of power by various means, after the extraction of the many valuable bye-products contained in the original gas. Burning coal under a boiler so as to utilize as much as possible of the heat produced was not a simple operation—it involved many complex chemical and physical reactions; so that the writer of the paper was fully justified in expecting a higher efficiency from gas-firing under favourable circumstances, as the burning of this fuel only represented the final stages of coal combustion.

Mr. H. W. G. HALBAUM said a month or two ago he was invited to examine an arrangement for firing boilers with a coal-tar bye-product. The experiment had been attended with a good deal of success; but until full results were ascertained, he would suggest that members kept an open mind on the subject.

Mr. SUGDEN said he had had to do with boilers fired with a mixture of coal-tar under tremendous heat; but the very high temperature going up the chimney was rather against the principle.

Mr. T. M. HUNTER replied at length in writing to the discussion. In the course of his remarks, he said that the President raised an interesting question in pointing out that gas can be transmitted more economically than steam. The transmission of gas over long distances has been done in America with great success. It is found that the loss in transmission is exceedingly small. The author believes that plant for the transmission of power by means of gas, as compared with electric power, is both cheaper to instal and much more economical to use. This is a point to keep in view should large gas-producer stations be put down at collieries. It would be far more economical to carry the gas in mains to existing electric power stations than to build new stations and transmit the power by wires. The question asked by Mr. Budge, as to whether it would pay collieries to gasify their fuel and to burn the gas in boilers, is rather outside the scope of the paper. At present this question is answered by the relation of the cost of the producer coal to the value of the sulphate of ammonia produced. The most valuable products from the present bye-product producers are the sulphate of ammonia and the gas. Tar, the other product, is only produced in small bulk, and compares very unfavourably with the tar produced from coke-oven plants. It does not supply benzol and the coal-tar colour bases; while the pitch is so impure that carbons cannot be made from it.

There is to be a special social meeting (to which ladies are invited) of the Midland Junior Gas Association, at the Council House, Birmingham, next Saturday evening. A musical programme has been arranged; and a sketch is promised by members of the Gas Department Council House Ladies' Staff.

Mr. James Campbell, the Engineer and Manager of the Dunfermline Corporation Gas-Works, has arranged for the members of the Scottish Junior Gas Association (Eastern District) to visit with him next Saturday the Rosyth Naval Base. The party will assemble in the gas show-rooms, Canmore Street, Dunfermline, at 2.45.

The "Glasgow" burner of Messrs. Peebles & Co., Ltd., of Tay Works, Bonnington, Edinburgh, was originally made for the stair-lights in Glasgow, and is the invention of Mr. Alex. Wilson, the Chief Engineer and General Manager to the Corporation Gas Department. It has since been adopted in many other places. The body is made of cast iron, and the mantle is held in a white magnesia ring fixed in the burner by a simple bayonet joint. Even after the mantle has been burned off, the ring can be removed along with the mantle when the burner requires to be cleaned or adjusted. Besides this, while reflecting the light, it acts as a warming tube to the cold air which is admitted at the edge of the globe. For lighting, a small air-ring with baffled openings is pushed up to a collar on the bunsen tube, thus cutting off the air supply; and the burner is lighted from the top of the chimney without explosion. On the collar dropping into place again, the bunsen flame is produced and a brilliant light obtained. The consumption may be anything from 0·7 c.ft. up to 1·2 c.ft. per hour, adjusted at 20-10ths pressure. The Glasgow setting is 0·7 c.ft.; and with 18 c.p. gas the burner gives 12 c.p.

EFFICIENCY OF INCANDESCENT GAS-LAMPS.

Influence of Quality of Gas and Other Factors.

The receipt from the United States Bureau of Standards at Washington of a copy of Technological Paper No. 110, makes it possible to supplement the reference to this matter appearing a fortnight ago [*ante*, p. 121]. The subject of the paper is the "Influence of Quality of Gas and Other Factors on the Efficiency of Gas-Mantle Lamps;" and the authors are Messrs. R. S. M'Bride, W. A. Dunkley, E. C. Crittenden, and A. H. Taylor, all of the Bureau of Standards.

Explaining the purpose and scope of the investigation, the authors say that, during the past few years there has been a growing tendency throughout the States towards the substitution of heating-value standards of gas supply for the candle-power standards previously in force. In many cases, this change in standards has been accompanied by a decrease in the number of heat units per cubic foot supplied in the gas; and the question has arisen whether the usefulness of a gas for various purposes is directly proportional to the total heating value of the gas. Claims have been made by some gas engineers that, within the limits of heating value of manufactured gas as usually supplied, the gases having the lower heating values can be used with higher efficiency—at least in some appliances—and also with less trouble, because of imperfect adjustment of the appliances. As part of the general investigation to determine the relative usefulness of gases of different heating values, the Bureau of Standards have experimented with mantle lighting, cooking, water heating, and other appliances, and have made observations of some appliances in actual use on customers' premises. The paper deals with one phase of this question—namely, the usefulness of gases of various qualities when burned under laboratory conditions in certain typical commercial mantle lamps. It also incidentally shows the influence of other factors on the efficiency, candle power, and satisfaction in use of these lamps.

The efficiency of the use of gas in mantle lighting is largely determined by the following variables, several of which have been investigated more or less completely:

1.—Peculiarities of the lamp, as determined by design of the type and by variation of individual units of a type.
2.—Condition of the lamp, especially the freedom from those partial obstructions in gas and air passages which are often very detrimental to efficiency.
3.—Quality of the mantle.
4.—Character of gas, including composition, density, heating value, &c.
5.—Lamp adjustment, both gas rate and air-shutter position.
6.—Atmospheric conditions, especially humidity, barometric pressure, and air currents about the lamp.
7.—Pressure of gas supply.

There is still much to be learned about the conditions affecting lamps; and only after a very extended study and a standardization of lamps and accessories could the operation of lamps under a given set of conditions be precisely predicted, and all the present irregularities of operation be explained. While at times these irregularities have been very annoying, it is believed that, in general, their effect has been sufficiently eliminated in this work to make the comparisons reliable within the limits of accuracy attainable.

Conditions of Comparison.

All other conditions remaining the same, the gas and air supply to a lamp may be adjusted to give (*a*) maximum candle power, (*b*) maximum efficiency, or (*c*) some arbitrarily chosen result depending upon local conditions. By efficiency at maximum candle power is meant the output of light per unit of heat liberated per hour when the lamp is producing the maximum intensity of light possible under the chosen set of operating conditions—only the gas and air being adjusted to produce this result. By efficiency at maximum efficiency is meant the light output per unit of heat liberated per hour when the gas and air supply are so adjusted that the efficiency is the maximum obtainable under the other prescribed conditions. The condition mentioned in (*c*) presupposes that the air and gas adjustment have been prescribed for some special reason—as, for example, in cases where the adjustment to maximum candle power would tend to carbon the mantles after a time—and consequently the air and gas have been changed from such an adjustment to avoid this.

The adjustment to give the maximum candle-power of the lamp is the condition probably most nearly approached in practice, since in making the adjustment an effort is usually made to secure the greatest brilliancy possible. The eye is able to detect fairly closely the point at which maximum brightness is obtained; but since the unaided eye is not sensitive to very small changes in brightness, and since the increasing brilliancy of some portions of a gas mantle is often accompanied by relative darkening of other parts, the true maximum can be obtained with certainty only with the aid of a photometer. By varying the gas and air adjustments, and at the same time noting the intensity of the light with a photometer, a point can be reached where any change of adjustment in either direction results in a decrease of light intensity. This condition may be sharply defined in some cases; but in others the change of intensity is so gradual that the adjustments may be varied over a considerable range without perceptibly affecting the intensity of the light, though the efficiency may be changing quite rapidly. It should be noted in this connection that the control of the many variables affecting mantle-lamp operation is so difficult, and a lamp is so sensitive to external influences, such as draughts, that the establishing of the true maximum to a high degree of certainty is well-nigh impossible. The point of maximum efficiency of a lamp is accompanied by no distinctive phenomenon apparent to the observer, even when aided by the photometer. Therefore, the efficiency at each observation must be determined by computation from measurements; and a sufficient number of observations at different adjustments must be made so that the maximum can be selected by graphical methods.

Though not commonly realized in practice, the adjustment to give maximum efficiency is of importance when comparing various gases and various conditions of supply, since clearly it is desirable that a lamp be operated as nearly as possible at such adjustment. Comparison has been made, therefore, both for adjustment for maximum candle-power and for maximum efficiency. The relative efficiencies with the different conditions of supply and operation were thus determined by comparing lumens per B.Th.U. per hour for the several combinations contrasted.

Gases Used for Comparison.

It was decided to confine the study to gases typical of those supplied in practice to various communities; and since the Bureau had received special inquiry concerning the relative usefulness of carburetted water gases of about 665 B.Th.U. and of 565 B.Th.U., and of coal gas of 565 B.Th.U., these were selected as the typical gases to be studied. For the sake of comparison and further study of certain variables, some specially enriched gases of higher heating value were also used in a few cases. Since typical commercial gases vary from time to time within certain limits, both as to composition and heating value, it was not considered necessary to maintain exactly the same quality of gases throughout the various series of tests; nor was it practicable to do so. An effort was made, however, to prevent as far as possible any variations between sets of observations which were intended to be comparable.

The authors then devote some attention to the work of previous investigators; and after detailing the experimental apparatus and methods employed in the tests now described, they proceed to deal with the

Results of the Experiments.

A large number of series of tests were needed in order to establish the various conclusions; but in this paper there are set forth only the conclusions and a few data typical of the numerous series carried out, to establish the magnitude and direction of influence of the various factors. It should be borne in mind, in considering these data, that the absolute values given should not be taken as of particular significance, since in many cases they depend upon the atmospheric conditions or the methods of testing arbitrarily chosen to bring out certain particular information; and, furthermore, these values would not always be reproducible with all lamps of a type, even if the working conditions were duplicated. However, these differences have, in general, been wholly eliminated from influence upon the qualitative conclusions, by careful control within the period of test of the factors that might affect the particular comparison desired; and it is believed that the results given show the influence of the variables in a way typical of all lamps of the types tested.

1.—*Determination of Reduction Factor.*

In order to facilitate the testing of mantle lamps, it was necessary to make a large number of the photometric measurements with apparatus by which the intensity of the light in one direction only could be measured. In order that these measurements in a single direction might show directly the variation in the total light output from the lamp, a direction was chosen where intensity bore a constant relation to mean spherical intensity under changing conditions. A distribution photometer was used to determine the value of this reduction factor—that is, the factor by which the candle-power in one direction should be multiplied in order to determine the mean spherical candle-power. These experiments confirmed the previous conclusions of others.

During the measurements, the lamp was so screened that only the light given off in a certain direction was reflected to the photometer by two plane mirrors. The position of these mirrors in a vertical plane relative to the lamp could be adjusted; and, by successive observations, a series of values was obtained representing the intensity at different angles at a point directly below the lamp to a point directly above it. By plotting the candle-power values from these observations, the distribution curves of the lamp under each operating condition were obtained.

To determine the reduction factor from the data available, the mean spherical candle power of the lamp under given conditions was computed by multiplying the intensity at each 10° interval by the factor representing the ratio of the area of a zone measured 5° each side of the angle to the total area of a sphere. The sum of all the products thus obtained gave the mean spherical candle power of the lamp. It is obvious that zones of service which are bounded by small circles—that is, those near the vertical axis—have the smallest area, and consequently are of least importance in the calculation. The most important directions, in which

the intensities should be carefully established, are those that are near the horizontal.

The absolute value of the reduction factor is of no great importance in any of the work of the following sections, since in practically all cases only the relative values on each lamp were of consequence. Nevertheless, in several instances it was found convenient to convert the observations to mean spherical candle power. The factor taken for the inverted lamp used was 0·80; and for the upright-mantle lamps, 0·75.

2.—*Pressure of Gas.*

The more important conclusions regarding the effects of pressure changes on the operation of the various lamps tested are as follows:

(*a*) The lower the pressure at which a lamp is adjusted to maximum candle power, the wider is the opening of the gas-adjusting valve, and consequently the greater is the gas consumption at any given pressure.

(*b*) For any adjustment of a lamp, the following results are obtained with changes of the pressure of the gas supplied (from the lowest pressure at which the lamp will remain lighted):

1.—The gas consumption is roughly proportional to the square root of the pressure.

2.—The efficiency increases up to a maximum with increasing pressure, after which it decreases with further increase of pressure.

3.—The candle power increases with increasing pressure up to and beyond the pressure for the maximum efficiency until a maximum candle power is obtained, after which the candle power decreases with further increase of pressure.

(*c*) The lower the pressure at which a lamp is adjusted to give maximum candle power, the greater is the opening of the gas-adjusting valve, the larger is the gas consumption at a given pressure, and the nearer to each other are the pressures for production of maximum efficiency and maximum candle power.

(*d*) When clean and with the air-shutters wide open, none of the lamps show any tendency to carbon the mantles under any of the pressure conditions tried.

(*e*) Regardless of the pressure at which the lamp has been adjusted to give maximum candle power, the maximum efficiency is almost invariably found at pressures between 2 in. and 4 in.

3.—*Gas and Air Adjustments.*

In comparing results obtained with different gases at a given pressure, two definite conditions were observed; one being the condition which gave the highest candle power attainable with the particular lamp, and the other that which gave the highest efficiency. In order to obtain these conditions, the flow of gas was varied step by step by means of the adjusting device provided in all the lamps; and then (in the lamps which had variable air-ports) at each setting of the gas-orifice the air-ports were set by trial at the position which gave the best performance.

The effects of changing the air adjustment depend, of course, on the other conditions of operation. It was usually found that with small gas consumption, and particularly with the leaner gases, the best performance was obtained with the air-ports closed as far as was possible. In some such cases, it was necessary to close the ports to prevent the flame flashing-back into the mixing-tube. With higher gas consumptions and with richer gases, the best performance was obtained with air-ports wide open. In fact, this was true over the greater part of the range of desirable operating conditions. At fairly high consumptions, even of lean gases, there is very little to be gained by closing the air-ports; while under some conditions closing them may greatly decrease the efficiency. The air-ports should nearly always be wide open.

In general, the greatest excess of air that can be obtained with any of the lamps experimented with has an effect much less serious than the effect of even a slight deficiency of air. Consequently, with the leaner gases, which require less air, the lamps are less sensitive to air-shutter adjustments.

Any maladjustment of air-shutter with rich gas almost invariably gives too little primary air, and hence produces a loss in efficiency and a likelihood of carboned mantles. With lean gases the air-shutter can often be nearly closed without great loss of efficiency; and there seems to be less tendency to carbon the mantle. The difficulty with the leaner gas is that there is greater tendency of the lamps to back-fire and burn in the mixing-tube, because the shutter is too wide open. However, this has been regarded as a less serious difficulty than that of carboning the mantles, because it is a condition that is at once noted by the user, and is therefore likely to be corrected promptly by partly closing the air-shutter.

4.—*Fitters' Adjustment.*

In adjusting a lamp for service, it is usual to regulate the gas supply so that the maximum candle-power, as judged by the eye, is obtained. However, one very large gas company in the United States have adopted a slightly different adjustment for the lamps which they maintain. The fitters employed by this company are instructed to adjust the gas supply until the candle-power is apparently at a maximum, and then to decrease the gas supply until a slight, but distinct, diminution in the candle-power is effected. The object in so adjusting is to diminish the probability of carboning the mantles. The point of maximum efficiency for a given lamp occurs at a lower gas consumption than the point of maximum candle-power; and therefore, in reducing the gas consumption slightly below the maximum candle-power point, the lamp is actually brought nearer to its point of maximum efficiency. In the course of the work, a number of fitters' adjustments were made by several observers according to these instructions; and it was found that, while there was considerable variation among the various adjustments made, the average of all such adjustments on a lamp was very close to the point of maximum efficiency.

This slight decrease in the gas consumption may have still another helpful effect, since such a change in adjustment will assist in correcting the effects of changes in gas pressure in cases where the pressure at which the lamp is operated is higher than the pressure at the time of adjustment—a condition not infrequently found, especially in cities where many lamps are periodically visited by the gas company or lamp companies for cleaning or adjustment.

5.—*Kind of Gas.*

In making comparisons of the operation of a lamp with various gases, all conditions other than the quality of the gas supply and the adjustment of the lamp were kept as constant as possible. In order to facilitate this, comparison was made only between results obtained on the same day, and using the same mantle, glassware, and measuring apparatus. Observations of barometric pressure, humidity, and temperature were made with sufficient frequency, so that any marked change in conditions would be noticed, and the proper corrections applied. In comparing two gases, the pressure at the burner was kept constant throughout the test; but the adjustments of the gas supply and the air-shutter were altered to ascertain the most favourable condition for each gas. A set of photometric readings was taken at each adjustment; and the rate of gas consumption was determined. From these data the efficiency of the lamp in lumens per B.Th.U. per hour was calculated. From the values obtained, the candle power and efficiency curves were plotted in the typical form. From these curves for each run, the candle power, efficiency, and consumption of gas could be noted for the points of maximum candle power and of maximum efficiency. Comparisons of gases were made between the observations of a single day at these two points.

Such comparisons were made between lean water gas and the city supply of rich mixed gas, between lean water gas and lean coal gas, and between the city supply and a specially enriched gas prepared by introducing benzol vapour into the city gas (changing the gas from 15 candles and 630 B.Th.U. to 21 candles and 650 B.Th.U., or higher). The comparison of lean water gas and the city supply showed the influence of the differences in total heating value for gases of rather similar composition. Benzolized gas was used to ascertain the influence of this hydrocarbon vapour upon the efficiency of the lamp. The influence of the different proportions of hydrogen, carbon monoxide, and methane, in coal gas as compared with water gas, is shown by another series of comparisons.

Between natural gas and manufactured gas comparisons cannot be made with conditions so closely similar as is done in comparing two kinds of gas which are more nearly alike. For example, instead of burning two gases in succession in the same lamp, each gas must be burned in a lamp adapted to it. Moreover, the pressures used for tests being like those commercially prevailing, are decidedly different for the two types of gas. In these tests the gas was used at pressures which were considered to represent common practice. These were 7 in. of water (approximately 4 oz. per sq. in.) for the natural gas, and 3 in. for the manufactured gas. Exact conclusions cannot be drawn from the small number of measurements made; but the degree of consistency of the results seems to justify the statement that in regular commercial lamps natural gas may be expected to give an efficiency (per heat unit) about 20 p.ct. lower than manufactured gas.

The following general conclusions are drawn from data compiled as to manufactured gas:

1.—The upright lamps show a distinctly higher efficiency with the lean water gas than with the city gas, both at maximum candle power and maximum efficiency adjustments; and the advantage is greater at maximum candle power than at maximum efficiency.

2.—The inverted lamps show no difference in efficiency, within the limits of experimental uncertainties, with the lean water gas and the city gas, either at maximum efficiency or maximum candle power adjustments.

3.—The upright-mantle lamps show, so far as the tests are significant, a distinct advantage of the benzol-enriched gas, both at maximum candle power and maximum efficiency adjustments.

4.—With both upright and inverted mantle lamps at either maximum candle-power or maximum efficiency, there is a distinct, but small, advantage of water gas over coal gas of the same total heating value, except in some cases at very low pressures (less than 2 in.), when lean water gas may not show as high efficiencies as rich water gas or lean coal gas, on account of the inability of the lamp to pass sufficient of the lean water gas to attain a true maximum efficiency. This advantage of water gas over coal gas probably results largely from the smaller loss of heat in the products with water gas than with coal gas of the same total heating value. [The lower net heating value is also a result of this.] However, there are some differences in flame characteristics that result from the differences in the proportions of hydrogen, carbon monoxide, and hydrocarbons; and these are perhaps fully as important as the differences in heat losses. In this connection, it is

interesting to note that the authors have found a distinct indication of higher heat input at maximum efficiency or at maximum candle-power with water gas than with coal gas, except in tests where the true maximum adjustment was not reached.

Greater ease of adjustment with lean gas than with rich gas is often claimed; but they have not been able to prove conclusively any such influence. There are distinct indications that the range of air-shutter adjustment is wider with lean gas, and a somewhat less definite indication that near the point of maximum efficiency there is a wider range of gas rate for equally good efficiency. Beyond this point, however, they would not be justified in drawing any conclusion as to the advantages of leaner gas. It was also noted that when operated on lean water gas with wide-open air-shutters, the inverted-mantle lamps become noisy at very low pressures, and in a few cases back-fire. No noticeably greater tendency to carboning of mantles was observed with one quality of gas than with another, provided the gas-passages of the lamp were clear, and the air-shutters were wide open.

From curves plotted, it is seen that the higher the heat input of of a lamp happens to be at maximum candle-power or at maximum efficiency, the higher is the candle-power produced. This is to be expected, unless there was a marked decrease in efficiency at the higher rates.

If adjusted from time to time to maintain maximum efficiency under changing atmospheric or other conditions, the smaller lamps seem to show markedly lower efficiencies the higher the heat input per hour for such adjustment happens to be. With similar variations, the upright lamps do not change in efficiency, while the inverted lamps show higher efficiencies with higher rates of heat input. When the adjustment to maximum candle-power is maintained, small lamps and upright lamps show behaviours similar to those just described; but inverted lamps show lower efficiencies with higher rates of heat input.

The variation in candle-power and efficiency of the lamps at the points of maximum candle-power and maximum efficiency, is the result of the large number of variables which affect these results, including lamp conditions, atmospheric conditions, and variations in the gas itself. But even considering all these variables, it is rather surprising that for these adjustments of maximum candle-power and maximum efficiency there should be found such great differences in the rate of heat input as was shown. However, it was not found that the heating value or kind of gas used had any consistent effect upon the rate of heat input at the maximum points. This variation proves how difficult it is to secure any significant photometric results on gas-mantle lamps without extremely long series of comparisons; and it makes clear why the calculations of various experimenters often disagree because of the limited number of tests used by each as a basis of his conclusions.

If an experimenter is to secure reproducible results, he must have perfect control over the atmospheric conditions, including the barometric pressure, humidity, and freedom from dust, absolutely clean passages in the lamp for gas and air, uniformity of mantle composition and quality, freedom from draughts, and a very unusual mechanical perfection in the form of lamp, since even a very slight irregularity or lack of symmetry of the entering gas stream will often have a very marked effect on the amount of air entrained and on the position of the flame in the mantle—thus affecting both the total output and the distribution of the light. This high mechanical perfection may be of little consequence in the ordinary use of the lamp; but for accuracy of laboratory tests it is an essential feature.

6.—*Fluctuation of Gas Quality.*

A series of tests was undertaken to ascertain the effect upon the efficiency of a lamp of changing the quality of the gas supplied to it without altering the adjustments of the gas and air supply. There was in most cases a distinct increase in operating efficiency when a lamp adjusted to maximum candle-power with one gas was operated on a leaner gas without a change of adjustment, and a more marked decrease in efficiency when a lamp adjusted with lean gas was operated with richer gas—all other conditions remaining unchanged. The explanation of this seems to be that when a lamp is adjusted to produce maximum candle-power with a given gas, it is using more gas than when adjusted to maximum efficiency, except in unusual cases when the maximum candle-power and maximum efficiency points are coincident. Consequently, a lamp adjusted to produce maximum candle-power with a rich gas is brought nearer to its maximum efficiency adjustment when a lower quality gas is substituted—the diminution in the heat supplied in the latter case tending to bring the lamp nearer to this maximum efficiency point. On the other hand, if a lamp adjusted to give maximum candle-power on a lean gas is operated without re-adjustment on a rich gas, the result is that it is supplied with such an excess of heat over the amount which it can efficiently utilize, that its operation is still further removed from the maximum efficiency point, and the efficiency suffers a very marked decrease. In some cases a lamp adjusted to a rich gas showed an increased efficiency when operated on a gas of medium quality; and the efficiency then decreases when a leaner gas is used.

The following conclusions applicable in nearly all cases covered by the experiments have been drawn from them:

1.—A given fluctuation in gas quality produces less change in efficiency of operation of a lamp with lean than with rich gas.

2.—If a lamp is adjusted for maximum candle-power, an increase in the heating value of the gas supplied to it produces a decrease in efficiency; and a decrease in the heating value produces an increase in efficiency.

7.—*Peculiarities of Individual Units.*

While studying the effect of different variables on a given lamp, tests were made on different lamps using the same gas with each, and keeping all other conditions constant, to determine the comparative operation of various lamps of the same type. It was found that in many cases the difference between the individual lamps was quite as great as the effect of a changing variable. However, it was seen that, in general, all lamps of a type were affected the same way by a variable, and that the relative effects were comparable even though the absolute values were different. It was found that some very cheap upright lamps gave higher efficiencies than more expensive ones, though the latter seemed to be capable of giving higher candle powers. The causes of this behaviour were not evident, though it seems likely that one was the different method of gas adjustment. It should be remarked that the flimsy construction of the cheap lamps might result in greatly decreased efficiency after operation for a short time.

General Conclusions.

With uniform gas quality and with good conditions of service in other particulars, the usefulness for mantle lighting of lean water gas of the qualities studied compared with rich water gas is slightly higher, for some types of lamps, than in proportion to the total heating values. Comparing lean coal gas and lean water gas of the qualities tested, the coal gas is slightly less useful; and this difference is about the same as the difference between the two qualities of water gas. Hence, it may be concluded that the usefulness of a uniform quality of coal gas of 550 to 575 B.Th.U. per c.ft., compared with a uniform supply of richer water gas—*e.g.*, one meeting a 22-c.p. requirement—is substantially in proportion to the heating values of the two gases. However, greater fluctuations in B.Th.U. per cubic foot, slightly greater difficulties in adjustment, and other factors met in the commercial use of lamps, make the higher quality gas somewhat less desirable per heat unit for general use than either of the two kinds of lean gas.

The influence of gas quality and other factors when the gas is burned in cooking, oven-heating, and water-heating appliances will be discussed in another publication of the Bureau. Further investigations are planned by the Bureau to extend the scope of this work, and to include more unusual supplies—such as blue water gas, producer gas, &c.—and to obtain further general information on the subjects thus far only partly investigated.

The Thomas Meter.

The Laclede Gas Light Company, of St. Louis, have recently installed a 750,000 c.ft. per hour Thomas meter to measure the total quantity of gas manufactured at one of their stations. The meter replaces four large wet meters; and it is located in the pipe-line between the purifiers and the storage holder. Giving details of the installation, the "Gas Record," of Chicago, says the gas flows from the relief holder through the exhauster, a set of purifiers, the Thomas meter, and into the storage holder. Thus the amount of gas passing from the relief holder through the purifiers and station-meter depends upon the speed at which the exhauster is operated; so that it is important to watch this speed. It is, however, difficult to determine the speed unless the operator can tell just how much gas is being pumped. The Thomas meter records the cubic feet of gas per hour at the standard units of 30 in. mercury and 60° Fahr., without any corrections for pressure and temperature. Further, it records this measure on a graphic chart which shows the amount and variation of the gas flow, and on an integrating instrument which shows the total gas during any given period. The chart is therefore a valuable aid to the engineer in charge of the operation of the exhauster. After observing it for a few days, and being familiar with the hourly rate at which the gas is made, he can so adjust the speed of the exhauster that it will pump an amount of gas approximately equal to the hourly make of the generator, and thus keep the relief holder from "blowing" or "landing." The curve drawn by the chart shows the relative speeds of the exhauster; so helping the new engineer to keep the position of the relief holder nearly stationary, and the exhauster at its best efficiency. The regulating and recording panels are about 150 ft. away from the meter-room.

How to Form a Company.—That it has run into a twelfth edition is sufficient evidence of the useful purpose that has been served by a little book containing information on the subject of company formation, written by Mr. Herbert W. Jordan—the Managing-Director of Messrs. Jordan & Sons, Ltd., of Nos. 116-117, Chancery Lane, W.C. 2, who publish it at the price of 1s. 4d. post free. With reconstruction, and industrial schemes of all kinds, in the air, the time is opportune to draw special attention to a book like this. Though investors may probably agree that there are some people who do not need to be told anything about how to form a company, there are doubtless many others who are just now wishful to acquaint themselves with facts of precisely the kind Mr. Jordan sets himself to explain.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Investigation Committee's Report.

SIR,—In view of the absolute necessity for the work of this Committee to be carried out by experienced men, it is rather absurd to find an advertisement of the Battersea Polytechnic, for an assistant to the Research Chemist, Mr. Wood, M.Sc., at £150 a year; and a Pass or Honours degree man is asked for. Such a salary is pounds less a week than paid to the modern stoker. Surely this cannot have the official sanction of the Institution. However strong the Committee, the work is done by the chemists employed; and its accuracy should be beyond dispute.

But concerning the report and the reply to criticism as published in the JOURNAL last week, I am rather surprised that the composition and physical constants of some of the gases employed have not been more seriously challenged. In the incandescent burner tests—*i.e.*, blue water gas with modern inerts, and in its admixture with coal gas 1 : 1—blue water gas is shown as having 19 p.ct. inerts (a ridiculous figure), and yet a B.Th.U. of 314. I should like to know how this is done. My Company manufacture 2000 million c.ft. of water gas in a year. It is our experience—and, in fact, the common experience—that 310 B.Th.U. is the maximum, and this with extremely low inerts; 300 B.Th.U. is the average. Then, in the admixture of coal and water gas in equal parts, the inerts are given as 24·6 p.ct., with a specific gravity of ·538—an impossible figure.

Much is made of the difference between B.Th.U. results as obtained by the calorimeter and analysis. The valuation of heavy hydrocarbons does not entirely explain this—in the case of blue water gas it hardly enters into it at all. We are not told how the calorimeter tests were carried out, the instrument used, &c. I have had experience with them all, and know that results can be varied by the method of working. The official method of the Gas Referees with the Boys calorimeter does not give an accurate result—it overstates the case. The errors immediately bring their elaborate correction for humidity to mind.

A "calorie" is the amount of heat required to raise 1 grm. of water 1° C. As water only has unit volume at 4° C., the measurement of the water volume at any other temperature renders the test inaccurate. On an average, 30° C. is the temperature of the effluent water; and this means an error of ½ p.ct., or 2·5 B.Th.U. on 500. Until recently, the Referees took no notice of the pressure of gas at the meter. They have now limited it to 3 in. of water, at which pressure there is an error of ¾ p.ct., or nearly 4 B.Th.U. on 500. Then, again, while the bulk of the tabular numbers are only in three figures, a greater accuracy than three figures cannot be obtained in the result. Of course, I do not know what "academic" corrections the Committee applied; but I know that usually a greater agreement can be obtained between the calorimeter and analysis.

Frankly, I look at this array of composition results, coming out to a total of 100 p.ct. in nearly every case—never more than 0·1 p.ct. from this total—with misgivings. I have carried out analyses in this way for years doing nitrogen determinations by Cu.O. combustion method, and I cannot arrive at 100 p.ct. every time. The fact is that water gas and coal gas frequently, if not always, contain traces of ethane and higher paraffins than methane, in which case procedure in analysis in the ordinary way does not give an accurate measure of the methane or the hydrogen present.

But, apart from these things, the report proves the truth of Lord Moulton's statement: "The question of flame temperature—*i.e.*, the temperature through the mantle—is clearly a thing which can be varied by devices which will make the flame not only fit the mantle at one pressure, but to a practical extent continue to fill it. That this has not been accomplished by these standard applications that have been tried, shows you a weakness in your accepted methods of using gas for this all-important purpose of the incandescent mantle."

I should like to suggest to the Committee, in continuing the work, that they make arrangements—it can be simply done—to measure within practical limits of accuracy the proportion of "primary air" in each test to the total required for combustion; and, further, in addition to the results obtained by filling the mantle by increased pressure through the same orifice, to endeavour to fill the mantle at all pressures by increasing the sizes of the orifice in the nipple. This might be done by having a revolving plate fitted to the burner, which would bring into position the different sizes of orifice as required. Then much useful information might be obtained in studying the results in relation to the "inert content" and the proportion of hydrogen in the gas.

J. H. FAIRWEATHER.

Chemical Laboratory, Gas-Works, Brentford, Feb. 1, 1919.

Acidity of Sulphate of Ammonia.

SIR,—The remarks of Mr. J. T. Sheard in the "JOURNAL" for the 21st ult. on the above subject, are very interesting. If, however, sulphate of ammonia containing free acid is washed with a neutral solution which is already saturated with sulphate of ammonia, it is obvious that the solution cannot dissolve any more. The acid removed by the solution can be neutralized with ammonia, and no loss occurs in any way.

With regard to Mr. Sheard's experiment, it would be instructive to know what was the final percentage of free acid in the sample of sulphate tested.

Feb. 1, 1919. A. L. B.

Steaming Horizontal Retorts.

SIR,—Mr. Rew might let us know the calorific value of the gas in B.Th.U., and the amount of coke gasified in the retort and used as firing under the retorts, and the make per mouthpiece per day steamed and unsteamed. An account of the coke sales per ton of coal carbonized, before steaming was adopted and since, would be of interest.

After all, it is a matter of the cheapest B.Th.U. Before steaming was adopted 11,300 c.ft. of (we will assume) 500 B.Th.U. gas was made giving 5,650,000 B.Th.U. per ton; but allowance will have to be made for the coke sold—say 8 cwt.—reducing the coal to 12 cwt., and bringing the B.Th.U. up to 9,416,600 per ton.

The gas made by steaming will be (say) 15,000 c.ft., 11,300 c.ft. of which may be coal gas of 500 B.Th.U. and 3700 c.ft. of very doubtful water gas of (say) 300 B.Th.U. This will bring the B.Th.U. up to 10,526,600 per ton without allowing for any coke used in the retort, or firing under the retort—probably about 2 cwt.

The question is, What does this extra 1,110,000 B.Th.U. cost in steam, fuel, and wear and tear?

It will be of interest to consider other gases and mixtures of gases.

BLUE WATER GAS at 54,000 c.ft. per ton of 320 B.Th.U. gives 17,280,000 B.Th.U. per ton of coke.

CARBURETTED HYDROGEN GAS made by the complete gasification of coal gives 40,000 c.ft. of 400 B.Th.U. gas per ton, or 16,000,000 B.Th.U.

MIXED COAL AND BLUE GAS, carbonizing coal and using the whole of the surplus coke for blue gas, gives:

Coal gas: 11,000 c.ft. of 600 B.Th.U. per ton . . .	6,600,000
Blue gas from 8 cwt. of coke, 21,600 c.ft., 320 B.Th.U.	6,912,000
	13,512,000

Giving a total of 32,100 c.ft. of a mixed gas of about 420 B.Th.U., allowing for the auto-carburation obtained from the coal tar hydrocarbons.

It seems to me that it is not a question of steaming horizontals, but one of washing them out altogether, and doing away with the laborious and costly retort-house work.

C. B. TULLY.

Kings Cliffe, Northants, Jan. 25, 1919.

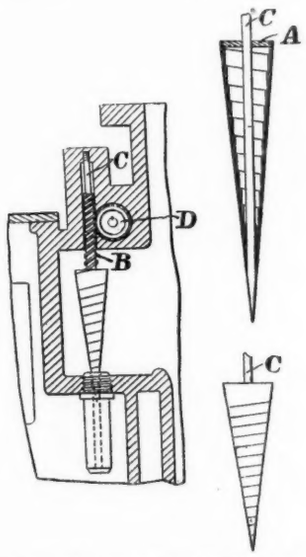
REGISTER OF PATENTS.

Valve Distributing Members for Gases. No. 121,156.

WASSERLEIN, V. E., of New York City.

No. 17,477; Nov. 26, 1917.

This invention has for its object to provide a valve-distributing member especially intended for, but not limited to, use in carburettors of internal combustion engines, "so that the flow of fuel therefrom can be minutely controlled by the operator in order that the leanness or richness of the charge may be properly adjusted to allow perfect functioning of the motor."



Wasserlein's Gas-Distributing Valve.

The valve distributing member comprises a flat spring metal strip coiled to form a helix, of which one end is connected to a needle-valve core and the other end to a rotatable disc, so as to control the outlet opening from the carburettor by the elongation or contraction of the helix.

The upper or outer convolution of the helix is secured to a disc A, connected to a quick-threaded screw B, being rotatably mounted upon the needle C, and provided with means for facilitating its rotation and maintaining it in the adjusted position until released. The element may be rotated from the wheel D through the screw B. When using the needle-valve in a carburettor, the operating means are rotated in a direction to cause elongation or contraction of the helix, the relative positioning of which and the gas outlet port of the carburettor are so adjusted as to decrease the flow of gas. But by rotating the operating means so as to cause elongation of the helix the opening between the fuel outlet and the helix is increased—thus permitting a greater flow of gas and (as a consequence) a richer charge. The needle C is fixedly

mounted upon its support, and has no movement with relation to the gas outlet port—the helix being the only movable element, and this is operated upon rotation of the means engaged with the outer or free convolution of the helix.

Gas-Producers.—No. 120,599.

SMITH, D. J., of Finsbury Park, N.

No. 15,089; Oct. 18, 1917.

This invention relates to gas producers and apparatus connected with them for supplying internal combustion engines; the producer being either of the suction or pressure type—that is, of the kind in which the gas is drawn from the producer by the suction of the engine, or that in which the supply is assisted by pressure supplied by a fan or the like. The inventor provides apparatus in which practically all the necessary operations are mechanically and positively effected or controlled—those in the producer being preferably effected by the internal combustion engine to which the producer supplies gas, and by which a very small fire bed and small producer are possible.

The process, it is claimed, provides a fire bed relatively shallow in proportion to its area; there being, therefore, no mass of fuel above undergoing distillation, nor a mass of ashes below mixed with the fuel. The whole fire bed and body of fuel is constantly agitated by reciprocating means during operation, and has the fuel fed thereto continuously in small, but regular, quantities, so that it rapidly becomes incandescent on reaching the bed, and thus maintains such a high temperature throughout the relatively small or shallow fire "that the gas given off is clean and of even quantity; thus obviating the slow distillation of fuel that usually obtains in gas producers."

The operations are controlled by a shaft preferably embodied with, or upon, the producer and driven by the engine supplied; the operations being: (1) Fuel feed to producer; (2) ash removal from producer; (3) rocking grate or continuous agitation of fuel; (4) water feed to feed heater and vaporizer; (5) water feed to scrubber when a wet scrubber is used.

The chief advantages said to be obtained by this invention are: (1) The reduction in size and weight of the producer in proportion to the volume of gas given off; (2) the rendering of all functions automatic after once starting, and making it possible for the producer to supply an engine with gas over a wide range of speed or volume; (3) the provision of means to control relatively the proportion of supplies of air, water, and fuel—such proportion to be possible of variation as required, while the producer is in operation; (4) a producer capable of functioning so long as it is driven and supplied with fuel and water; (5) a flexible producer providing gas in proportion to the speed of the engine supplied or the demands made upon it; (6) automatic stoking and removal of ashes—thus preventing the slowing or stopping of the engine arising from the production of poorer gas or the stoppage of production; and (7) the ability to control the production of gas in anticipation of increased or decreased demands.

Cooling and Cleansing Devices for Gas. No. 121,177.

SMITH, D. J., of Finsbury Park, N.

No. 17,982; Dec. 5, 1917.

These improvements in gas-scrubbers are intended mainly for use in connection with suction-gas plants for supplying internal combustion engines, but are also applicable to other types of plant, or for other gas from which it is desired to remove any matter held in suspension and also reduce the temperature of the gas to the desired degree.

The apparatus comprises three main parts—a feed heater or preliminary cooler, the cooler proper, and the filter. In its simplest form it consists of two boxes or headers (of cast metal) fitted with removable lids secured airtight. The boxes are connected by sets of tubes arranged vertically between the headers. The gas from the producer or other source enters a chamber formed at one end of a header, and passes through tubes to the other header. Around the tubes a water-tight jacket is fitted, and does not communicate with either the top or bottom header. Through the jacket, water is caused to pass, in order that it may, in cooling the gases, become heated before passing to the steam-boiler or vapour generator of the producer, or be otherwise employed or run to waste.

When the gas has arrived in the other header through the feed heating or preliminary cooling tubes, it passes through sets of tubes, which may or may not be fitted with other cooling means. The gas may be further cooled, either by convection or by a current of air supplied by a fan, and directed upon the tubes by sheet metal baffles arranged around them. Air tubes may be fitted inside and concentric with the cooling tubes, and passing through the headers, so that the air circulates through the cooling tubes as well as outside them.

The cooled gas then enters tubes of larger diameter connecting the two headers, fitted with long conical gauze strainers or funnels. The gas passing up through the strainers has all material in suspension removed, and then passes to the engine or to any other purpose for which it may be required. In the headers a number of vertical plates are fitted, against which the gas impinges.

The action and operation of the pump referred to is described in patent No. 120,599.

Gas Pressure Regulating and Controlling Devices. No. 121,342.

HARRIS, G. H., of Wadebridge, Cornwall.

No. 18,426; Dec. 12, 1917.

This invention relates to apparatus for regulating and controlling the pressure of gas supplied more particularly in connection with motor engines, where the main supply of gas is stored under pressure in cylinders, from which cylinders the gas is withdrawn and its pressure reduced before entering the cylinders of the motors, or being used for fuel, lighting, or other purposes.

In one known arrangement—comprising a tank having a float controlled gas inlet and an outlet which is normally free—the depression of the level in the gas compartment raises the level in the other compartment against atmospheric pressure. In another suggested arrangement, the gas-main and controlling valve are arranged entirely outside of the casing; a branch from the main opening into one compartment to act upon the liquid level in it, the other compartment (provided with a closable opening) being utilized for the float only.

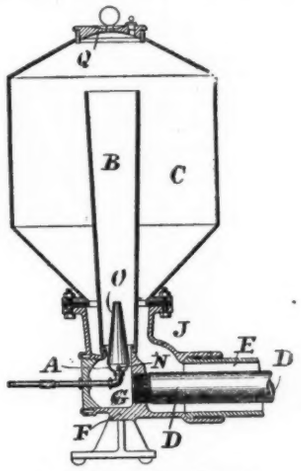
The present invention consists in a device of the type first referred to, in which the gas compartment is provided with an inlet and outlet—the former alone being controlled by a float-operated valve within the compartment, while the liquid level as it rises in the other compartment compresses air in the space above, which is also fitted with a float if desired.

Gas-Heating Stoves.—No. 121,619.

LEA, F. M., of Birmingham.

No. 16,236 of 1917; May 3, 1918.

This invention relates to gas-heating stoves of the type in which the products of combustion are passed from a chimney or injector into a larger casing surrounding the injector, in which they are cooled sufficiently to pass out at a level adjacent to the burner.



Lea's Gas-Heating Burner.

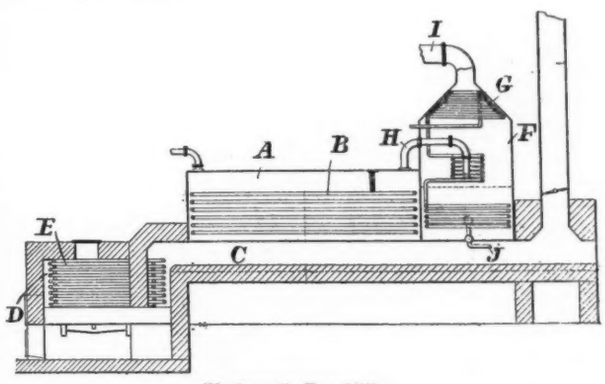
The burner A enters a chimney or shaft B, leading up within the stove casing or chamber C. The air for the burner is introduced at D, and the burnt gas outlet is at E. The bottom portion F provides a closed burner chamber G. It also provides a connection at J for the chimney, and around a gas-passage K to the outlet pipe. The chimney has a slight taper from a larger outlet end to the end adjacent the burner. The burner has a gas-nozzle N and a relatively long truncated conoidal mixing tube O, adjustable with respect to the gas-nozzle. This burner is not claimed except in combination with apparatus shown. The casing C has a lid Q for cleansing purposes, with an inspection aperture closed by a plug; so that the burner flame can be regulated as required.

Distillation of Tar.—No. 121,804.

WESTWOOD, J. W., of Edgbaston, Birmingham.

No. 47; Jan. 2, 1918.

This invention relates to the dehydration of tar in apparatus illustrated diagrammatically.



Westwood's Tar-Still.

The tar to be treated is subjected to preliminary heating in a tank [not shown] heated by high-pressure hot-water tubes to about 140° C. It is thus rendered sufficiently fluid to permit of its being pumped, and much of its aqueous solution vaporized—the vapour escaping direct to

the atmosphere. From the tank the hot tar is pumped through a still, comprising a cylindrical vessel A, provided with high-pressure hot-water tubes B that further raise the temperature to about 230° C. The tank is mounted over a hot-gas flue C, passing from a furnace D containing hot-water tubes E in series with the tubes B. The latter derive their heat from the furnace tube; and supplementary heat is supplied to the still from the flue gases. From the still the tar passes into the final separating tank F, which is also heated internally by high-pressure hot-water tubes G, arranged in three coils as shown—one at the upper end, one at the lower end, and one in the middle (of smaller diameter) surrounding the end of the pipe H.

The top and bottom coils serve to heat the upper and lower ends of the tank F. The tar passes into the final separating tank, through the pipe H, in the form of a spray or thin film-like streams, due to the pressure maintained on the liquid in the still by the pump supplying the still from the first-named tank. Outlet apertures (such as perforations or slots) are provided in the pipe H or in a nozzle attached to the end of it. As it enters the last-named tank, the spray or films of tar encounter the middle part of the heating coil which surrounds the outlet of the pipe H. The remaining water or aqueous solution is thus removed in a vaporous form, and also such light oils as can be distilled by the temperature employed. The vapours pass out from the upper part of the separating tank through an outlet I, and are subjected to condensation and other treatment in the usual manner. The distilled tar or pitch passes out from the bottom of the tank by a pipe J.

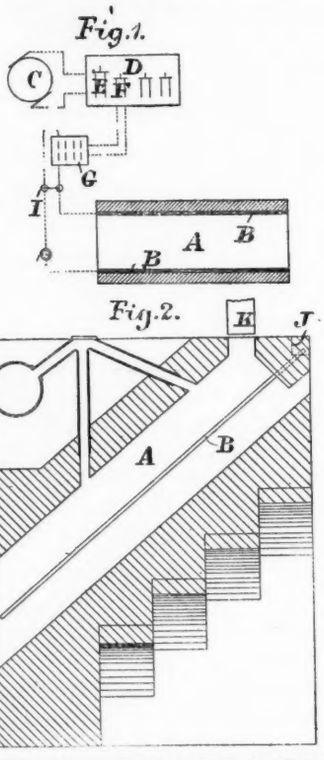
Carbonization and Distillation of Coal by Electricity.—No. 121,854.

SIMPSON, C. W., of Headingley, Leeds, and MOORHOUSE, L., of Barnsley.

No. 2878; Feb. 19, 1918.

The patentees say: "In the working of gas-retorts and coke-ovens, great difficulty is ordinarily experienced in obtaining and maintaining an even temperature in all parts of the retort or oven for a specified period, as is necessary for the production of good coke and fuel." Their invention is "designed to provide a simple solution of this problem, by a complete change in the heating of the inside of the retort or oven and in the consequent action on its contents."

The proposal consists essentially in the carbonization of coal by transmitting electric current through the charge by means of electrodes embedded in the lining of the retort or oven in direct contact with the charge. For this purpose, rods, bars, or segments of good electric conducting material—for instance, copper, aluminium, iron, compressed breeze, or the like—are fitted within the retort or oven, either longitudinally or otherwise, so as to serve as positive and negative electrodes; and electric current is passed through the embedded electrodes in direct contact with the charge, which latter is preferably of slack or pea form. Then, by means of resistance and a control-switch, electric current can be conveyed through the charge, "so that any desired heat can be obtained and evenly maintained within, and at all parts of the retort, or even during the carbonization and distillation of the charge."



Simpson and Moorhouse's Electrically Heated Retort System.

The principle of the invention is illustrated diagrammatically in fig. 1, in which A represents the retort; B, the electrodes; C, the dynamo; D, the switchboard; E, the main switch; F, the circuit switch; G, the section box; H, the resistance; and I, the control switch.

Fig. 2 is a sectional side elevation, illustrating the invention as applied to an inclined retort. Here A represents the coking chamber; B, the electrodes; J, a connection pocket; and K, the charging shoot.

It is claimed that the system is equally applicable to horizontal, inclined, or vertical retorts, and one person can operate and regulate the heat of an unlimited number of them by means of a control switchboard and a recording pyrometer fitted in each retort. Moreover, the system is said to be adapted for low-temperature carbonization as well as for medium and high temperatures. The plant can be rendered self-contained, by using some of the gas produced in the retort to drive a gas-engine, which, in turn, is coupled to the dynamo. The electrical system of carbonizing and distilling coal will also, it is claimed, produce a richer and better gas for bye-products, and will minimize waste heat and abolish regenerative flues and chimneys—thereby "effecting an unlimited saving of labour and materials, and at the same time assisting in abolishing the smoke nuisance."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 29.]

Nos. 1353—1924.

BEILBY, Sir G. T. & H. M.—"Manufacture of reducing gases from carbonaceous materials." No. 1784.
BRADNEY, W. J.—"Saucepans for use on gas stoves and rings." No. 1503.
BRIGHTEN, H. W.—"Purifying producer gas for heating purposes." No. 1868.
CARPENTER, C. C.—"Purification of coal, &c., gas." No. 1649.
DAY, A.—"Inverted incandescent gas-mantles." No. 1878.
EVANS, E. V.—"Manufacture of ammonium sulphate." No. 1427.
GREENWOOD, C. V.—"Gas, &c., storage vessels." No. 1479.
HAWKINS, S. C.—"Gas-stoves, &c." No. 1556.
HOLLINGS, H.—See Evans. No. 1427.
LEWIS, W. H.—See Hawkins. No. 1556.
MUNK, A. H.—"Apparatus for drilling and tapping mains under pressure, and for inserting ferrules or pipe connections therein." No. 1834.
MUSGRAVE, H.—See Hawkins. No. 1556.
PARRISH, P.—"Manufacture of neutral sulphate of ammonia." No. 1744.
PERRY, W. P.—"Apparatus for distilling carbonaceous material." Nos. 1425, 1426.
POWELL, J. A.—"Burning fuel to generate gas for domestic consumption." No. 1661.
RENAULT, L.—"Gas, &c., turbines." No. 1658.
SMITH, E. W.—"Diaphragms for dry gas-meters." No. 1725.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of ammonium sulphate." No. 1427.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of sulphate of ammonia." No. 1428.
SOUTH METROPOLITAN GAS COMPANY.—"Purification of coal, &c., gas." No. 1649.
SOUTH METROPOLITAN GAS COMPANY.—"Manufacture of neutral sulphate of ammonia." No. 1744.
STOKES, W. B.—"Gas-stoves, &c."—See Hawkins. No. 1556.
STONE & Co., J.—See Munk. No. 1834.
VALON, W. A. M.—See Parrish No. 1744.
WRIGHT, O. W.—See South Metropolitan Gas Company. No. 1428.

Licences Granted.

Nos. 22,433 of 1910, 27,696 of 1911, and 1382 of 1913. Grantee: THEISEN. Applicant: JAMES KEITH AND BLACKMAN COMPANY, LTD.

A Toluol Plant Offer.—The Edinburgh and Leith Gas Commissioners have declined to accept the offer of the Government to sell for half cost price the toluol plant, &c., at the Granton Gas-Works.

Elstree and Boreham Wood Gas-Works.—Reporting on the Elstree and Boreham Wood Gas Company's Provisional Order application, the Parliamentary Committee of the Middlesex County Council say the County Engineer states that the application has reference to the extension of the Elstree and Boreham Wood Gas-Works, which are situate in the county of Herts. The extension will, he gathers, be confined to that county; and this being so, no Middlesex interest appears to be affected.

Gas to Replace Electricity.—The Lighting Committee of the Chelmsford Town Council report that they have had before them a recommendation made by the Gas Committee, and confirmed by the Council, that the Lighting Committee be requested to consider the advisability of taking steps to light the streets in the North and South Wards of the borough by means of gas-lamps when the Electric Supply Corporation's contract expires next year. They have requested the Gas Engineer to submit a report on the matter to the Committee at their next meeting.

Carbon Products and Oil Distillation Company, Ltd.—A company bearing this name has been registered, with a capital of £138,000, in 100,000 priority shares of 2s. 6d. each, and 251,000 ordinary shares of 10s. each. The objects are stated to be to acquire certain patents, the benefit of a tenancy agreement and certain fixtures, plant, stock, stores and tools, and to carry on the business indicated by the title. The purchase consideration is £6000 in cash and £125,496 10s. in ordinary shares. The vendors are the Union and Rhodesian Trust, Ltd., Finsbury Pavement House, E.C., F. Hall-Jones, Parliament Mansions, S.W., and Coal Distillers, Ltd., No. 124, Chancery Lane, W.C. The first Directors are Messrs. R. Delabere and R. Simpson, C.A., both of Finsbury Pavement House, E.C.

MISCELLANEOUS NEWS.

BELFAST STRIKE AND THE GAS SUPPLY.

Sympathy will be felt with Mr. James D. Smith, M.Inst.C.E., the Engineer and Manager of the Belfast Corporation Gas-Works, in the difficult conditions under which he is at present labouring.

The strike in the city, some particulars as to which were given in last week's "JOURNAL," originated in a demand for a 44-hour week by the shipyard workers; and the gas-works men are all members of the Municipal Employees' Association, which is affiliated with the Shipyard Federation. When, therefore, the shipyard men ceased work, the men at the gas-works came out also—though a request was acceded to that sufficient men should remain to keep the plant safe and the mains alive. The bulk of the retorts were let-down as soon as possible; and since then there has only been sent out gas at 3-10ths pressure. This, of course, is useless for the town supply; and numerous works have had to be closed for want of power and light, throwing thousands of workpeople out of employment.

The action of the Municipal Employees' Association in thus holding-up the city, seems to have been quite uncalled for. Under the Standing Orders of the Corporation, the Gas Department are bound to pay the trade union rate of the district; and if the shipyard men win their case, the Corporation are bound to follow as a matter of course. This view has been put before the Society; but the reply is that until all the members of the Federation have got the shorter week, the Municipal services will not be resumed. Thus the matter rests at the moment; but Mr. Smith is prepared to increase the supply of gas to the city within a few hours after a settlement of the strike.

BRENTFORD GAS COMPANY.

Report and Accounts.

At the annual meeting to-morrow, the Directors will report that the accounts show a profit on the revenue account for the year ended Dec. 31 of £93,618. After providing for the interim dividend to June 30, and fixed charges, there remains the sum of £38,504, which, with the balance brought forward, makes the amount of £91,867 available for dividends. The Directors recommend the declaration of the statutory dividends, subject to income-tax, namely: At the rate of 5 p.ct. per annum on the preference stock; at the rate of £3 14s. p.ct. per annum on the "A" consolidated stock; and at the rate of £3 2s. 6d. p.ct. per annum on the "B" consolidated stock. For the first time, the gas sold shows a decrease of 7·08 p.ct. under that of 1917. This is owing to the Household Fuel and Lighting Order, 1918, and the closing of munition factories towards the end of the year. The number of consumers is 121,903, as against 121,078 last year. The Directors were again compelled to raise the price of gas, from April last, from 3s. 4d. to 4s. per 1000 c.ft.

From the accounts accompanying the report, it is seen that the revenue from the sale of gas amounted to £765,502; from rental of meters, stoves, and fittings, to £94,584; and from the sale of residual products, to £205,049—the total receipts being £1,065,288. The expenditure on the manufacture of gas was £774,302; on distribution, £105,885; on management, £28,583; on rent, rates, and taxes, £36,160—the total expenses being £971,669. The balance carried to the profit and loss account is £93,618.

The working statements indicate that 235,137 tons of coal and 2,028,697 gallons of oil were used in the past year in the production of 4,492,346,000 c.ft. of gas (including 1,802,847,000 c.ft. of carburetted water gas), of which 4,102,246,000 c.ft. were sold and 4,167,721,000 c.ft. were accounted for.

DEMANDS OF THE MINERS.

Action by the Federation of British Industries.

The serious importance to British industrial enterprise of the demands approved at the Southport conference of the Miners' Federation, for a six hours working day and 30 p.ct. increase in wages, is drawn attention to in the "Bulletin" of the Federation of British Industries.

The question was considered at the meeting of the Organization and Management Committee of the Federation; and it was decided that a letter containing the following resolution should be sent to all the Government Departments concerned.

> That the Government be strongly urged to take no action with reference to the granting of the recent demands of the Miners' Federation for the limitation of working day and increase of wages until the fullest information as to the economic results to British industry of the granting of such demands has been obtained.

The Group and Sub-Group Committees are being called together to consider this matter. They have also been asked to prepare detailed estimates of the practical effect of the granting of the demands on their particular trades; and this evidence will be presented to the Government at the earliest opportunity. As there is a possibility of an urgent demand for information by the Government, it has been decided to ask representative firms to give similar estimates.

By this means, it is hoped to impress strongly upon the Government the necessity of making a thorough survey of the new industrial conditions which might arise if the miners' demands were granted, as an essential first step in any action they may take; and, secondly, to obtain such evidence as may be necessary in order to substantiate the recommendation to the Government for the institution of a full inquiry.

THE MANUFACTURE OF CYANAMIDE.

Statements have appeared in the press that the St. Helens Colliery and Brickworks Company, Ltd., at Workington, has been acquired on a cash basis of £12 for each £5 share of the issued capital, by a Syndicate of which Mr. A. E. Barton, the Chairman of Nitrogen Products and Carbide Company, is the head. The last-named Company, it is said, are to establish a works on the site of the old West Cumberland works at Workington for themanufacture of cyanamide—a fertilizer which is the product of a process in which carbide and nitrogen extracted from the atmosphere are brought together. Coal, limestone, and cheap water supply are all near at hand in the district. Carbide, of course, will be an important product of the new industry; and the plant will provide for the working of all the bye-products of coal—such as sulphate of ammonia, benzol, oils, pitch, &c. The works will need 3000 tons of coal per day; and turbines will generate 120,000 H.P. A capital of £5,500,000 is involved. The works will take two-and-a-half years to complete, and will ultimately employ 4000 hands.

GAS COMPANIES AND CO-PARTNERSHIP.

The second number of the "Industrial League Journal," which has just been issued, includes contributions from the Right Hon. G. H. Roberts, M.P. (Minister of Labour), the Right Hon. J. R. Clynes, M.P. (late Minister of Food), Mr. G. J. Wardle, M.P. (Parliamentary Secretary of the Board of Trade), and others. There is also a report of a conference held at Caxton Hall some months ago on the subject of "Profit-Sharing Schemes." At this conference, Mr. J. P. Thomas, in opening the discussion, after dealing with other countries, concluded with the following reference to the co-partnership scheme of the South Metropolitan Gas Company

Of course, there are many firms in this country in which profit-sharing and co-partnership systems are in operation; and it is very difficult to know which one to cite. I rather hesitate to take an example of a gas company, because it has been said that profit-sharing is particularly applicable to gas companies. As far as my knowledge of the subject goes, there is no reason why it should be specially applicable to gas, except that the consumer himself has an interest in the profits being increased so that the price of gas may be decreased. So far as the workman is concerned, there is no reason for better terms from a gas company than any other concern. Nevertheless, I cannot refrain from mentioning the case of the South Metropolitan Gas Company, in which Sir George Livesey did such wonderful work with his staff. They have had a profit-sharing and co-partnership scheme in operation for some thirty years. . . . Whereas the staff for some twenty-eight years have been receiving a bonus, it ceased eighteen months ago; and I think the Gas Company will be quite prepared to state that there has been no unrest as the result of this. The workers feel that their investments are safe, and the return to industrial prosperity will not be long delayed. They still have representation at the shareholders' meetings, and, in fact, a proportion of the men sit on the Board of Directors.

City of Durham Gas Company.—The accounts for the past year show a divisible balance of £1502. The Directors propose to take £540 from the reserve, and pay final dividends at the rate of 5 p.ct. per annum on the original and 3½ p.ct. per annum on the additional capital.

Coal Supplies at Edinburgh.—The Engineer (Mr. Alexander Masterton) reported to the Edinburgh and Leith Gas Commissioners last Thursday that the arrangements recently made by the Coal Controller in Glasgow had resulted in an addition to the stock of coal of 3000 tons. The daily deliveries still continue to be satisfactory, with a marginal quantity which is placed to reserve. The stock on the 13th ult. was over 15,000 tons; being an increase of 5000 tons above the lowest quantity held in November last.

Dundee Gas-Works Extension.—At a meeting of Dundee Gas Committee, the Engineer and Manager (Mr. Alex. Yuill) reported, with regard to future extension of the gas-works, that there were two sites suitable—one to the east and one to the west of a certain mill at Dock Street. The one to the east might not be available on account of the Railway Company's arrangements, and difficulty might be experienced in acquiring parliamentary powers for the one on the west. In view of these facts, he thought it would be advisable for the Council not to lose control of the ground they already had at Gourlay's Yard.

Export of Gas-Meters.—The export of "gas-meters and component parts thereof made wholly or partly of tinplate," which has been prohibited to all destinations, is now prohibited only to countries neighbouring enemy countries—*i.e.*, all destinations in European and Asiatic Russia and in other Foreign Countries in Europe and on the Mediterranean, except France and French Possessions, Italy and Italian Possessions, Belgium, Portugal, Greece, Spain and Morocco, Palestine and Syria, as far north as a line from Alexandretta to Aleppo inclusive, and as far East as the Hejaz railway inclusive, and to all parts in any such foreign countries.

Gas-Works Fatality.—An accident at the Gaythorn Gas-Works, of the Manchester Corporation, in which George Williams (aged 60), a labourer, who had been in the employment of the Gas Department for over forty years, was mangled to death, was investigated by the Manchester City Coroner on Wednesday of last week. It appeared that shortly after noon on the previous day, the man, who had been assisting with some repairs, was missed from a platform beside a hopper, and an examination of the machinery showed that he had apparently fallen from the platform into the coke-crushing plant. The Coroner, returning a verdict of "Accidental death," said that although no one saw the man fall into the machine, he might have momentarily forgotten the existence of the hole. The Manager of the works had promised to provide some protection against similar accidents.

SELECT COMMITTEE ON TRANSPORT.

Some Further Evidence.

Reference was made in last week's issue [p. 178] to the evidence of some of the earlier witnesses before the Select Committee who were appointed for the purpose of considering what steps, if any, it is desirable to take to develop and improve the internal facilities for transport within the United Kingdom, to secure effective supervision and co-ordination, and to ensure that such developments and improvements shall be adequate and suitable to meet the national requirements.

These witnesses were followed by Mr. Frank Potter, the General Manager of the Great Western Railway, who gave evidence with regard to the provision of road motor transport facilities by railway companies before the war and at the present time, and the general railway policy in the matter. His Company, he said, have probably done more than any other in providing road motor services. With the exception of 3-ton motor lorries on two routes, the various road motor services do not cater for traffic ordinarily conveyed by goods train. In connection with the user of canals generally, one has always to bear in mind that the terminal question is a very important one. Canals have gone out of use to a large extent, because they do not connect-up with the origin of the traffic, or admit of the traffic that can pass over them between certain points being freely and readily delivered to its destination. Quite an extensive use is made of the canals in South Staffordshire; but in other parts of the country where his Company own canals they do not find it possible to make any use of them. There is certain traffic for which the canals could be utilized; but taking the heaviest traffic which passes over the railways of the country—that is, the coal traffic—it is not easy to quite see how the canals can be employed to any greater extent than they are to-day for the purpose of handling this traffic. The coal traffic now is put into trucks at the screens at the pit's mouth, and taken to its destination. Witness said he was not in favour of the nationalization of the railways, in the sense in which this term is usually employed; but he did not think there was any reason why a well-considered system of control should not be established.

Mr. I. T. Williams, the Acting Manager and Chief Goods Manager of the London and North-Western Railway Company, and representative of the railways on the Canal Control Committee, submitted particulars as to railway-owned canals, and other matters under railway control. He said that the circumstances arising out of the war, and the establishment of the Canal Control Committee, have undoubtedly had the effect of creating a closer measure of co-operation between railways and canals than existed before. One of the primary objects of the Canal Control Committee was to arrest the decline in the carryings of the inland waterways, and to endeavour if possible to increase the tonnage conveyed, with a view to affording relief to the railway companies. The inducement to forward goods by water has been largely removed by the fact that canal charges are now frequently the same as, or higher than, those of the railways. Having regard to the trend of events, there appears to be little evidence to support any anticipation of a revival of the canal-carrying trade after the war, if the waterways are separately conducted as rival undertakings to the railways. If, however, they could be worked in co-operation with the railways, as adjuncts or feeders, and as an alternative and cheaper form of transport for heavy and bulky material of a non-urgent character, and able to bear only a low freight charge, it is possible that a larger field of usefulness lies before them. Under such an arrangement, the canals would become part of a co-ordinated scheme of inland transport, which could be utilized to the national advantage. In view of the difficulties of persuading traders to divert traffic to canals, it would appear necessary that some post-war substitute for the emergency powers of the Defence of the Realm Act should be devised enabling the railways to refuse traffic, and thus to force it on to the waterways. It seems essential that the conveyance charges on the waterways shall be less than on the railways for corresponding services, and also that they should be made uniform. In any scheme of canal development, it should be possible for a trader to apply at one canal office in any locality for facilities for the despatch of traffic to a given destination on any one waterway. During the war, the railway rate has remained the same, and the canal rate has gone up.

The next witness was Sir Alexander K. Butterworth, the General Manager of the North-Eastern Railway Company, and a member of the Railway Executive Committee, who gave evidence on behalf of the latter body on questions concerning railways and ports. He dealt with the advantages of docks being owned by railway companies.

Mr. A. W. Gattie, the Chairman of the New Transport Company, said it was obviously of great importance that the business of unloading and reloading a ship should be done as speedily as possible. The bringing of the goods to the ship's side, and the taking of them away, must be a very slow process, so long as they were carried to and fro in railway wagons. The machines of the new Transport Company have, however, he said, entirely disposed of this difficulty; and with their aid a quay can be supplied with, or relieved of, thousands of tons of goods at a rate quite impossible with the old methods. The next problem was to get the goods from the ship to the quay, and *vice versâ;* and this requirement should be met by the introduction of a new type of electric crane invented by him for the purpose. By bringing one of these cranes into operation over each of a ship's hatches, a considerable number of squads of men may be employed in loading the almost continuous series of powerful hoists each crane brings into action. The cranes would be capable of carrying 12 tons per minute or less, as determined. In some circumstances there could be advantageously used containers holding several tons, which would be suitable to travel by ship, barge, rail, or road. Detailing his other suggestions, witness said that machinery existing at Battersea, installed in a properly-designed dockhouse, would be able to sort 500 tray-loads of heavy bales per minute; and by the use of the container system, trains serving this dockhouse could be unloaded and reloaded in three or four minutes.

The New Transport Company's proposal, as applied to the United Kingdom, was, he went on, to put clearing-houses at all large centres—London, Birmingham, Leeds, Manchester, Liverpool, Bristol, Glasgow, Edinburgh, Belfast, and Dublin. Sub-clearing houses at smaller centres, and properly-equipped goods stations designed on clearing house principles, would be requisite. According to figures given to him by the Post Office, 115 towns absorb 60 p.ct. of the traffic, 300 towns a further 30 p.ct.; and the remaining 10 p.ct. is absorbed by very small places. A clearing-house is a meeting place for vehicles, with an equipment to enable it to exchange the loads carried by those vehicles in the quickest, safest, and cheapest manner. A load of goods brought to a clearing-house by one railway system could be transferred to another railway system in a couple of minutes. Setting aside all the risks to life and property attendant upon shunting, the clearing-house method gives from 2000 to 3000 times the speed.

Questioned as to the bearing of his proposed system on the heavy coal traffic of the country, Mr. Gattie said the tonnage of coal could be transferred from one train to another by means of cranes. He had been told that it would take 36 hours to send coal to the Croydon Gas-Works from Child's Hill, about 18 miles away; but he could not conceive the possibility of it taking more than an hour under clearing-house conditions. Coal could go in the trucks in which it was loaded at the collieries to the point where it was needed. The great economy here of his system would be found in the clearance of the metals. For one thing, fewer wagons would be wanted, and so it would be practicable to put an automatic brake on each railway vehicle, which would allow heavy goods trains to run faster. In the case of coal for export, the use of containers would be an enormous advantage for unloading into the ship. Domestic coal could be put in sacks at the colliery, unloaded at the clearing-house in a very brief space, and distributed among the consumers in London. There was also no reason at all why it could not be taken and stored in suitable large hoppers for delivery as required. This had the disadvantage of introducing another handling, which might be objected to on the ground of disintegration of the coal; but, on the other hand, shunting, which he suggested should be done away with, caused a very great deal of detrition. Mainly, his substitute for the present system was that the coal should be loaded in containers—*i.e.*, the whole of the upper part of the truck should be detachable. This container would be lifted off by a crane, and placed in a building properly designed for its reception, which could be of a very considerable height, and occupy a comparatively small space. Then one could call for a particular container load of coal at any moment, and have it loaded out. This would be very much cheaper and more convenient than the present system of storing it in sidings. His electric crane had not been made yet; and all he was able to submit were drawings. In the clearing-house, certain cranes would take the things from east to west, and others from north to south. There would also be belt conveyors. If he were allowed to increase the capital of his Company, which had already done more than it ever arranged to do with its existing capital, it was intended to build works of a proper kind, and give a full demonstration of the proposals. To do this would require at least £100,000. An application for leave to raise a certain amount of capital had recently been refused by the Treasury, on the ground that the Company's activities were not in the public interest, and also that the Committee already had the matter under consideration. In other words, the issue of capital apparently would depend more or less upon the verdict of the Committee. He did not contend that all coal coming into London for domestic purposes should pass through this clearing-house. Nothing would go into it unless there was a very good reason for so doing.

Two sittings of the Committee, and part of a third, were occupied in the examination of Mr. Gattie; and in their subsequent report, the Committee said: "The proposals are certainly attractive, and the inventions are highly ingenious; but the Committee find it impossible, on the evidence which has been presented to them, to come to any conclusion in regard to the practical value of the proposals, or to make any recommendation in regard to their adoption. Before any such steps could be taken, it would be necessary in the first place to obtain expert tests of the working results of the various items of the apparatus, and of the operation of the sorting appliances as a whole on a practical scale. The Committee have been informed by Mr. Gattie that his Company desire to erect at their own cost an experimental plant for the purpose of enabling mechanical tests such as have been indicated to be carried out, but that the request of his Company for permission to issue for this purpose new capital to an amount of not less than £100,000 has not yet been acceded to by the Treasury New Issues Committee. While the Committee recognize that capital so employed would be devoted to a highly speculative use, they nevertheless recommend that permission to raise the funds required be given."

Plant for Coke-Ovens and Manufacture of Bye-Products.—The "Board of Trade Journal" announces that certain Dutch firms which are interested in the projected establishment of coke-furnaces in the Netherlands will shortly be in a position to accept delivery of plant and machinery. The object of the undertaking—apart from the manufacture of coke, tar, benzol, and sulphate of ammonia—will be to supply light and power to the neighbouring districts. United Kingdom manufacturers will, on application to the Comptroller-General, Department of Overseas Trade (Development and Intelligence), No. 73, Basinghall Street, London, E.C.2., be placed in touch with the Directors of this undertaking. The Reference to be quoted is No. 140.

Fatality at Keighley.—A verdict of "Accidental death" was returned at an inquest last week on Philip W. Frost (46), who had died after being injured while attending to the coke-screens at the Keighley Gas-Works. Albert Edward Clayton, under whose instructions Frost was working, said the deceased was clearing a choke in a hopper carrying coke, and his clothing got caught in a belt and shafting. Mr. W. Baillie, the Gas Engineer, said there had been no previous accidents. The original idea that the man had been caught by means of a bag on his shoulder had been found to be wrong. They had lately had much trouble with the hoppers choking owing to the bad quality of coal; the Government having diverted the best coal. The shafting had now been covered, and the belt protected. He had not hitherto had reason to think the gearing was dangerous.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 3.

At the present time the only disquieting feature of the London market is the position of 60's crude carbolic acid, consequent upon the stagnation in the crystal trade, caused mainly by the knowledge of large stock held by an official department that may be offered for sale. No recent business in 60's crude carbolic has been reported. The values of pitch and creosote are well maintained. Other tar products do not call for remark.

Sulphate of ammonia for home agriculture continues to be sold and delivered under the official order.

Tar Products in the Provinces.

Feb. 3.

The average values for gas-works products during the week were: Gas-werks coal tar, 31s. 9d. to 36s. 9d. Pitch, East Coast, 45s. to 47s. 6d. per ton; West Coast—Manchester 37s. 6d. to 40s., Liverpool 37s. 6d. to 40s., Clyde 37s. 6d. to 40s. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 7d. to 1s. 8d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. 6d. to 2s. 7d. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4¼d. to 4⅜d. Heavy oils, in bulk, North, 5½d. to 6d. Naphthalene, £25 to £30; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per minimum 40 p.ct.; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Labour troubles in various centres are having their effect upon conditions in the tar products markets; and unless matters are speedily settled, outputs of many products which are of considerable use in reconstruction will be affected. Pitch is by far and away the best market; the continued demand from the Continent is of itself sufficient to maintain a strong tone, especially in London. Beyond this, however, there is the prospect of very large quantities being wanted for road purposes; so that there is some justification for anticipating, as many shrewd manufacturers do, that prices are likely to move further upwards. Tar is also in good demand. Naphthas are an interesting market. Crudes are without change; but heavy is a shade lower, and so is solvent. In the latter case, the reason is not far to seek, as the trade in solvent is intimately bound up with the rubber goods industry. While the war was on, the Government required enormous quantities of rubber goods, such as motor tyres, shock absorbers, &c.; and the solvent sold was then mostly for war purposes on official account. But this demand ceased suddenly, and the requirements for solvent from rubber goods trades has not yet reached war time standards of quantity, for the simple reason that it is taking rather longer for the trades concerned to reorganize for peace-time production than was anticipated; the difficulty being accentuated by the uncertain position of the raw rubber market itself. The more one looks fairly at the situation, however, the more must one conclude that there will be an enormous increase in the rubber goods trades with the signing of peace. It may therefore be safely assumed that the present phase in solvent naphtha is purely a temporary one, and that prices will re-adjust themselves in the near future. Cresylic acid is lower; the demand for disinfectant purposes showing signs of slackening off. Creosote is in good demand, and rather dearer. Benzol continues to be readily purchased as motor spirit; while dye interests are buying more freely of toluol at slightly better prices. Naphthalenes are without change, and other products call for no special comment.

The range of quotations is as follows:

Benzol: 90% London, 2s. per gallon; 50-90%, 2s. per gallon.

Carbolic Acid: Crude 60's 3s. 6d. per gallon; crystals 40% London 1s. 1d. to 1s. 2d. per lb.; provinces 1s. per lb.

Crude Tar: London 39s. to 41s.; Midlands 33s. to 35s.; North 32s. to 34s. per ton *ex* works.

Pitch: London, 67s. 6d. to 70s. per ton; East Coast, 47s. 6d. to 50s. per ton; West Coast 43s. to 44s., with Manchester 40s. per ton and Glasgow 47s. 6d. per ton; South Wales, 48s. per ton.

Solvent Naphtha: London 2s. 9d. to 3s. Provinces average 2s. 8d. per gallon.

Crude Naphtha: Naked 1s. 1d. per gallon.

Heavy Naphtha: 2s. 9d. per gallon.

Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.

Toluol: Naked, 3s. 4½d. per gallon nominal.

Creosote: Nominal, London 4¼d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4⅜d. per gallon); heavy oil, 4¼d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: London, 3s. 3d.; Provinces, 3s. per gallon.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

The home trade remains about the same; and beyond rumours of a coming combine among provincial manufactures (which is said to be originating on the North-East Coast) for the development of export trade, there is practically nothing fresh in the situation.

The Ilkeston Corporation Gas Committee have decided to increase the salary of Mr. J. E. Holt (the Gas Manager) from £315 to £355 per annum, and that of Mr. F. C. Humphrys (the Assistant Manager) from £187 10s. to £200 a year.

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Steel Exports.—The Minister of Munitions gives notice that, following on the withdrawal on Jan. 31 of the certain subsidies on steel, the drawbacks payable to the Government in respect of exports of steel have been reduced as from Feb. 1. Particulars of the reduced rates of drawbacks may be obtained on application to the Ministry of Munitions Steel Department (Room No. 104), Hotel Victoria, W.C.2.

Maryborough Gas-Works Close.—The workers at Maryborough (Queen's County) Gas-Works having gone on strike on a demand for an increase of 12s. per week in wages and a 48-hour week, with an eight-hour day arrangement, the undertaking has been closed-down. An offer by the Directors of an eight-hour day and a 4s. increase has been rejected. Candles and lamps are in use in business establishments and private houses.

Road Subsidence at Halesowen.—A subsidence has taken place at Quarry Lane, Halesowen, which is causing serious damage to the highway and property in the vicinity. A small crowning-in occurred in the road; and this has gradually extended, until the highway is affected for a distance of fifteen to twenty yards, and has completely blocked it up for vehicular traffic. The subsidence has damaged the gas-mains, which have been temporarily relaid.

Sleaford Gas Company, Ltd.—For the year ended Dec. 31, the Directors recommend that a dividend be paid at the rate of 10 p.ct. per annum, free of income-tax. There has been an increase in the consumption of gas; but the reduction in the quantity of coal allotted to the Company by the Coal Controller has made it very difficult to meet the demands of the public for an efficient supply. The number of prepayment meters in use at Dec. 31 was 850, and of ordinary meters 665—a total of 1515.

Coal Shortage at Brighouse.—Brighouse is suffering badly from coal shortage. In response to complaints at the Town Council meeting last week about insufficient street lighting and bad house supply, the Chairman of the Gas Committee (Mr. J. F. Bottomley) said the matter was solely dependent on the coal supply. The Committee had already decided not to light any more street-lamps this winter; there being only 150 tons of coal in stock at the time this decision was made. On the day of the Council meeting, there was a stock of only 50 tons; but there had been some delivery during the day.

The German Welsbach Company.—The accounts of German Welsbach Company for the year ended June 30 last show a gross profit rather in excess of that for the previous twelve months; but the net profit fell to 8,530,828 marks (about £418,180 at pre-war exchange), as compared with 14,356,674 marks for 1916-17. The dividend declared for the year on the ordinary shares was at the rate of 25 p.ct., as in the preceding year. The reduction in net profit is ascribed to the general rise in working expenses and taxation, and reduced profit on war contracts. War taxation had made a great inroad on the Company's reserve fund.

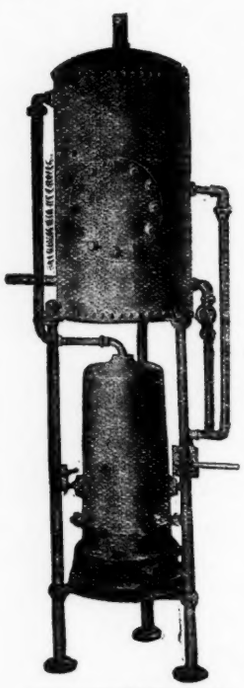
A Report upon the Stockport Gas-Works.—With reference to an announcement appearing in the "JOURNAL" some weeks ago, to the effect that an expert was to be appointed to investigate the working of the Stockport Corporation gas undertaking, it may be stated that Mr. W. Doig-Gibb is the Engineer who has been called in to make the report.

Price of Aluminium.—The price at which the Government are prepared to sell their stock of aluminium has been reduced to £150 per ton for 98-99 p.ct. ingot, at which price steps have been taken to stabilize the market. Arrangements have been made in regard to these stocks that they shall be disposed of in such a way as to avoid dislocation in the aluminium industry.

No Present Curtailment at Goole.—With reference to a paragraph which appeared in last week's "JOURNAL," it is gratifying to learn that, though the Council have decided to reduce the pressure of gas from 9.30 p.m. until 6 a.m., should the coal strike continue and stocks become lower, this step has not yet been actually resorted to; and there will be no reduction unless matters become worse.

Output and Stocks of Iron and Steel.—The total stocks of iron and steel in the hands of the Government available for disposal at the end of December, 1918, were as follows: Pig iron (Swedish), 80,000 tons; shell steel billets (suitable for re-rolling), 210,000 tons; ships' plates (purchased in U.S.A.), 19,800 tons; bright steel, 5000 tons; and bar iron (Swedish), 10,000 tons. These figures, which include all stocks of U.S.A. steel in this country, only represent stocks in the hands of the Government still to be disposed of, and do not include stocks in the hands of private firms, neither do they include stocks of forgings and semi-finished shell.

Tramore Gas Undertaking.—A deputation from the local Ratepayers' Association was received by the Tramore (co. Waterford) Public Health Committee in reference to the agreement for the purchase of the gas-works by Mr. P. Troy. Tramore, which is within six miles of Waterford, is one of the principal South of Ireland watering-places. The discussion dealt largely with the price of gas. On Mr. Troy's behalf, Mr. Chapman (solicitor) thought 10s. per 1000 c.ft., as fixed, would work out fairly, with coal at £3 a ton; the price to go down as the coal price fell. Mr. Costello, a member of the deputation, favoured an 8s. maximum, and urged that if 10s. were agreed to now it might be maintained. The Committee Chairman (Mr. C. Gallway, D.L.) stated that the wages bill was very serious. Why, asked Mr. E. J. Cahill, should they dispose of the undertaking to an individual at all? The Chairman said they had to dispose of it because it was being worked at a loss. Mr. Lavelle, late Manager of the works, stated that in 1917 he requested leave to expend £100 in stopping gas leakages in the streets; but it was turned down. Mr. Costello was of opinion that there had been a lot of wastage through leakages. It was intimated that the Ratepayers' Committee would further consider the price of gas.



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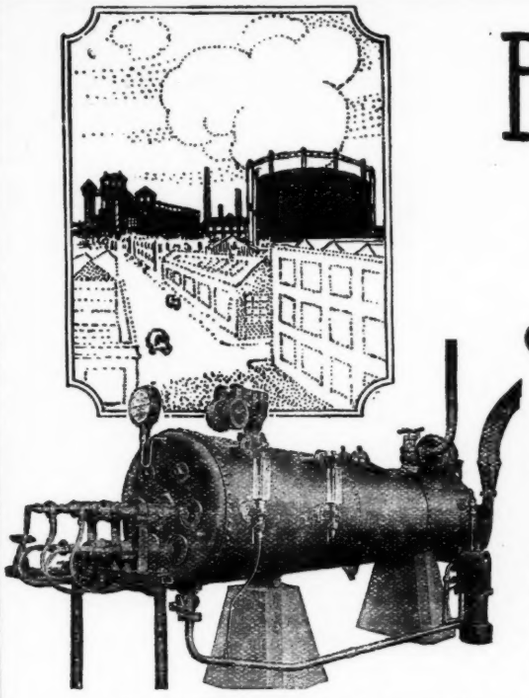

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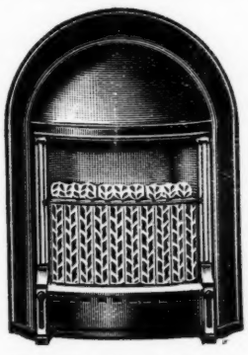

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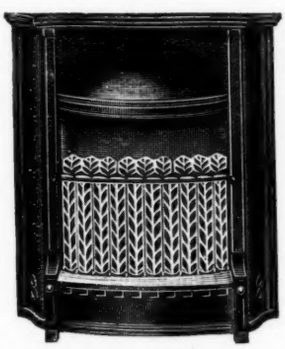

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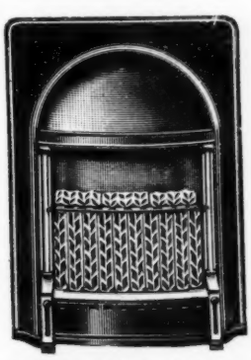

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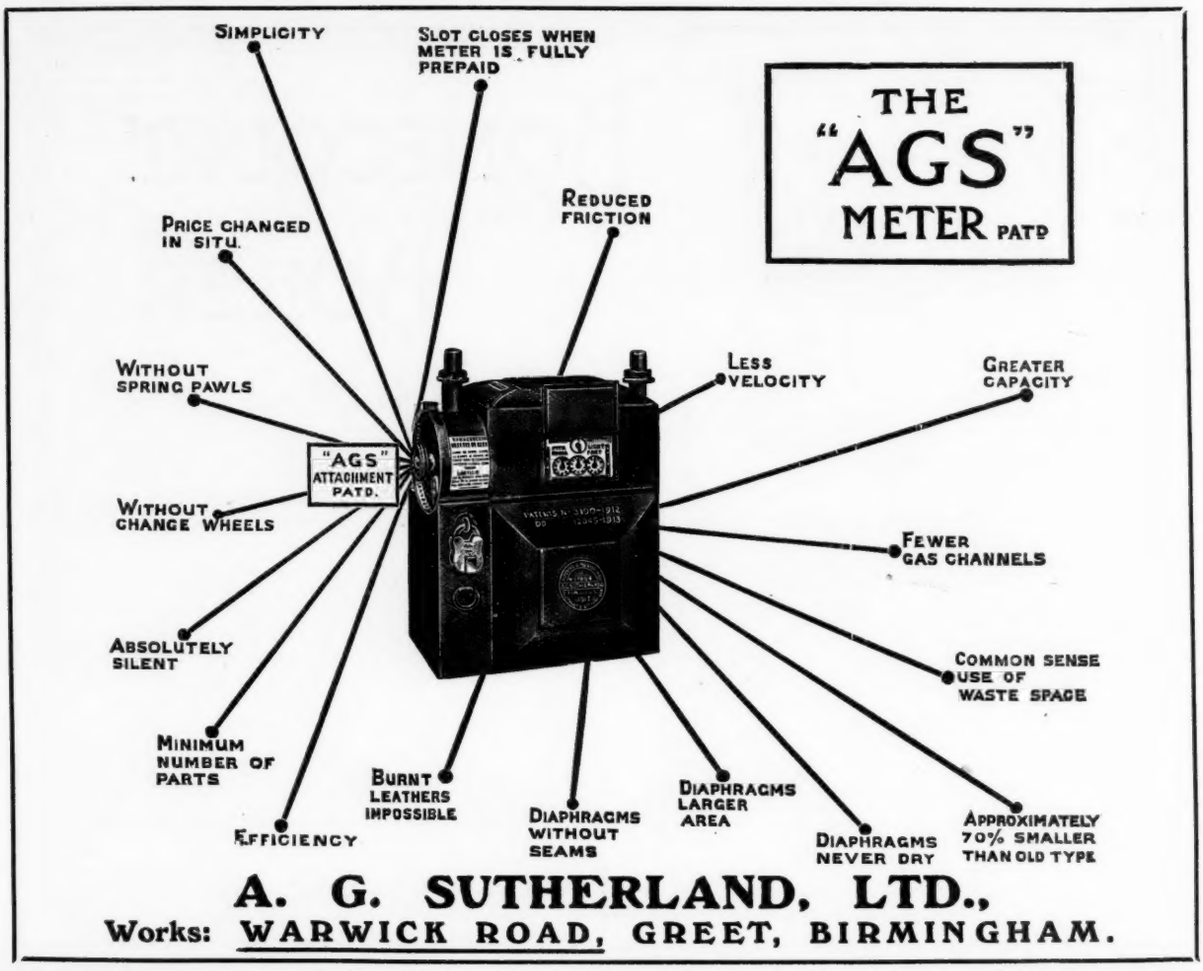

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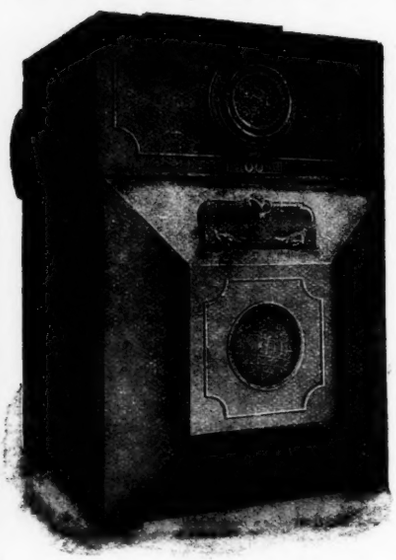

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Edinburgh and Leith Gas Commissioners and Demobilization.

At their meeting on Monday of last week, the Edinburgh and Leith Gas Commissioners had before them a letter from the National Union of Corporation Workers, in which two requests were made: (1) That, in consequence of demobilization and the return of employees to their pre-war posts, all persons engaged since Aug. 4, 1914, should be discharged in order of juniority—females to precede males; and (2) that the old method of promoting meter surveyors to the consumers' clerks office should be resumed. In reporting on these requests, the Engineer (Mr. Alexander Masterton) observed that he was endeavouring to follow out the principle of discharging the women, and, other things being equal, the temporary men, according to length of service. As regards the transference of men from the meter reading department to the consumers' clerks office, this matter had been before the Commissioners on more than one occasion, and in the past the question had been left to the discretion of the Engineer and the Treasurer. The Engineer's report regarding the reinstatement of discharged sailors and soldiers was approved; and the question of the promotion of meter-readers was referred to a Sub-Committee.

Bournemouth Gas and Water Company's Bill.

The opposition has been growing in Poole to the scheme of the Bournemouth Gas and Water Company to extend their works in the borough. The Town Council's decision to oppose the Bill in Parliament has met with the approval of the Trades and Labour Council, and also of the Poole Fishermen's Association—the representative handing in their petition declaring that the proposals would be detrimental to the fishermen's industry. On the last occasion on which the subject was before the Local Authority, Alderman Julyan strongly urged that, while putting themselves in a position to enter opposition, the Council should exhaust every means in their power to get remedied features in the Bill which might be objectionable. The resolution to oppose was, however, carried. Owners of property situated in the district which would be directly affected have organized a definite plan of campaign in opposition to the scheme, as detrimental to property and inimical to the welfare of the inhabitants. In addition to sending round a petition to which 1500 signatures were obtained up to a certain date, a meeting of those interested was called in the Guildhall. It was decided to promote a separate and independent opposition as distinct from that being brought to bear by the Town Council, and to take steps to raise funds for the employment of counsel and other purposes. It was also stated at the meeting that the Harbour Commissioners were in opposition. The Bournemouth Town Council's Finance Committee have simply instructed the Town Clerk "as to the necessary steps to be taken on behalf of the Council;" and it is estimated that the chief object will be to see "that in the financial changes proposed there is nothing that will rob the borough of advantages at present enjoyed."

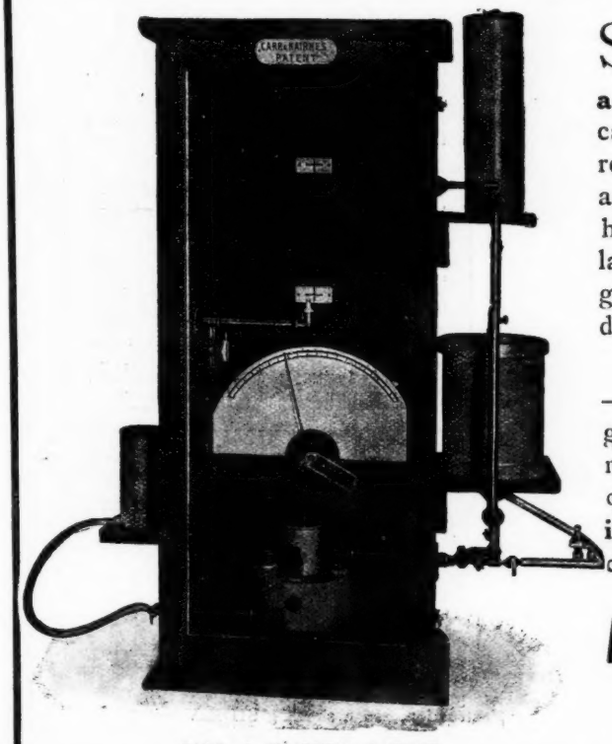
Irish Lighting Restrictions.—A deputation of Dublin traders has waited on Mr. James M'Mahon, the Under-Secretary for Ireland, at Dublin Castle, to ask for a variation of the lighting restrictions, imposed owing to coal shortage, so as to permit of later opening of offices, stores, and shops as the days continue to lengthen and less artificial light becomes necessary. Mr. M'Mahon promised that the matter would receive serious consideration, and would be dealt with by his Excellency Viscount French, the Viceroy.

Reduced Gas Consumption at Pudsey.—Dealing with the accounts for the year 1918, the Directors of the Pudsey Gas Company state that the advance made a year ago in the price of gas proved insufficient to meet the increased costs; and a further 4d. per 1000 c.ft. had to be put upon the price as from July 1. Beyond this, they have—in view of a most serious reduction in the sales of gas, by reason of the closing-down of munition works and the effect of the Fuel and Lighting Order, together with the further increased cost of all kinds of material and wages—now been compelled to advance the price another 5d., making the charge 3s. 8d. per 1000 c.ft. The dividend recommended will, with the interim one, make a distribution of 7 p.ct. for the year.

Edinburgh and the Calorific Power Test.—The proposal of the Edinburgh and Leith Gas Commissioners to substitute a calorific power test for the present illuminating power test having met with the opposition of the Edinburgh Corporation and others, the Works Committee of the Commissioners recently instructed the Clerk to forward copies of the reports of the Engineer (Mr. Alexander Masterton) and the Consulting Engineer (Mr. W. R. Herring) to the Corporations of Edinburgh and Leith, the Midlothian County Council, Miss Walkinshaw, and the Caledonian Railway Company, together with an offer to the Corporations to have a meeting for the purpose of giving any further explanations that may be desired, with the object of satisfying the Corporations that the Commissioners' proposal was expedient. The Clerk was also instructed to ask that the Government inquiry into the application should be postponed from Jan. 20.

Monazite Sand in Brazil.—In a note upon the monazite sand industry of Brazil, the "Ironmonger" says that the cost of bagging the sand, after it has been mined and stored at the plant, usually averages 17s. 6d. per ton; and including the cost of mining, transporting, and concentrating the sand at the plant, the outlay averages between 70s. and 96s. a ton. When the German Trust had a monopoly of the sale of Brazilian monazite sand, the price at Victoria, the capital of the State of Espirito Santo, ranged between 88s. and 105s. a ton; but recently the uniform price, delivered at Victoria, has approximated 105s. per unit of thorium, upon which all sales are based. The stocks of monazite sand are kept at minimum quantities; and as a rule the exporters never have on hand more than enough to fill one or two medium orders. There are no facilities for satisfactorily determining the thorium content of monazite sand in Brazil; and the preliminary estimates of 5 p.ct. are usually modified up to as high as 6 p.ct. or down to as low as 4½ p.ct., according to the beds from which the sand is taken.

JET CALORIMETER.



CARR & NAIRNE'S PATENT.

SPECIALLY designed by the Inventors for use on crude gas, to show, **within a few minutes of its generation,** the calorific power of the gas made in the retort house or other plant. It is placed as near as practically possible to the retort house, and therefore enables any irregularity to be corrected instantaneously, and gas of an even quality to be manufactured day and night.

The desideratum of all Gas Engineers—that of supplying an evenly constituted gas to the consumers—can be accomplished, many complaints attributable to varying quality of gas avoided, **and a greatly increased make of gas per ton of coal carbonized is secured.**

ALEXANDER WRIGHT & CO., LD.

WESTMINSTER.

AGENTS:

Australia—FYVIE & STEWART, 360, Collins Street, Melbourne.
Canada—W. P. ROPER, Merchants' Bank Building, Montreal.

Maximum Prices for Steel Slabs, &c.—Notice has been given by the Minister of Munitions of a revised list of maximum prices and provisions which, as from Dec. 1 last, have been substituted for those contained in a notice dated Nov. 8, 1918, relating to steel slabs, plates, strips, and pieces cut from plates, suitable for re-rolling, and steel plates, sheets, and black plate, all open annealed, produced in sheet mills.

Stealing a Gas Company's Safe.—The two men who were charged with having broken and entered an office in the yard of the Elsw'ck Gas-Works and stolen a safe containing about £40, the property of the Newcastle and Gateshead Gas Company, have been sent to prison, one for six months and the other for four months. William H. Hutchinson, a clerk in charge of the gas-works, said the door of the office and a desk had been forced, several drawers ransacked, and the safe removed to a quiet place about 50 yards away. The back of the safe had been forced off.

The Halifax Corporation are faced with an application for a further advance of 10s. per week in wages of the workers in the gas and other departments. These workers are already receiving 30s. per week above pre-war rates.

The Dundee Trades Council have registered a motion of protest against the action of the Corporation Gas Committee in suggesting that the Corporation should "become linked-up with private employers (National Gas Council) in a protective industry against workers."

Damage amounting to several thousands of pounds was caused by fire recently at a spinning mill owned by the Darby Mills Company, Heywood, Lancs. The fire, which is believed to have been caused by a gas-mantle breaking and falling on some cotton, completely gutted the mill.

The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company resolved to recommend to the proprietors, subject to audit, the payment for the half year ended Dec. 31, of dividends at the rate of 4 p.ct. per annum upon the preference stock and 3½ p.ct. per annum upon the ordinary stock of the Company.

Mr. Eldred Hallas, M.P., one of the Secretaries of the Birmingham Gas Workers and General Labourers Union, has intimated his intention to resign his seat on the City Council of Birmingham; and Mr. Gregory, his colleague in the local labour world, is to be nominated as an alderman, in succession to the late Mr. G. Shann, the mill-worker, who became M.A., and a prominent Socialist.

Consequent upon the development of the Dalmarnock Gas-Works of the Glasgow Corporation involving increased duties and responsibilities on the Works Manager (who is also at present in charge of the Dalmarnock chemical works), it has been remitted to a Special Sub-Committee to consider and report as to the advisability of appointing a Chemical Engineer to superintend the production of tar, ammoniacal liquor, &c.

Colonel Sir E. A. Brotherton, M.P. for Wakefield, and head of Messrs. Brotherton & Co., tar distillers, is to present a suitably engraved silver medallion to each of the 250 repatriated prisoners of war belonging to the city.

Many readers will learn with regret of the death on Jan. 23 of Mr. John E. Holland, who was for over 36 years the West of England representative of Messrs. Falk, Stadelmann, & Co., Ltd. Of recent years, he has not been quite so active as formerly, and limited his exertions to the larger show-rooms which were set up in his district. His unfailing courtesy and attention to business obtained for him a large circle of friends.

Mr. R. J. Rogers, Fittings Superintendent of the Birmingham Corporation Gas Department addressed the members of the Rotary Club on Monday of last week on the subject of street accidents. He advocated the formation of a "Safety-First" Council, consisting of representatives of the Watch, Tramways, Lighting, and other Committees concerned with traffic, members of the Education Committee, and delegates of transport organizations.

At a meeting of the Works Committee of the Commissioners on the 20th ult., the Convener (Councillor Douglas Elliot) and the Engineer (Mr. Alexander Masterton) were authorized to attend meetings in Glasgow and London respectively, which had been called to consider the question of a 47-hour week, and resolved to await reports of these meetings before considering the request of the engineers, &c., at the Granton Gas-Works for a 47-hour week.

Intimation is made by Messrs. John Terry & Co. (acting as Agents for the Company) that the Metropolitan Gas Company of Melbourne cable that their profits for the half year to Dec. 31 last were £107,000. A dividend of 6s. 6d. per share has been declared for the half year; a sum of £39,500 has been transferred to the reserve fund; and a balance of £77,500 is carried forward. Dividend drafts to absentee shareholders will be posted by the first mail after the 1st inst.

The annual report of the Wandsworth Ratepayers' Association states that the question of gas supply was frequently before the Committee, with reference to inadequate supply, poor quality, increased cost, street lighting, economy in use, &c. In this last respect, it is regretted that the Gas Company could not see their way to adopt the suggestion of the Committee, and instruct consumers as to the best methods of using gas to ensure efficiency with economy.

At a Hornsey inquest on Thomas Coupe, aged 80, and his wife, aged 82, who died from the effects of coal gas poisoning, a neighbour, who occasionally helped with the housework, stated that she was unable to gain admittance, and called the police. In the bedroom they found the couple dead; the man on the floor and the woman in bed. The gas was turned on; and a small lamp was alight on the table. A pair of pliers was on the floor near the gas-stove; and it was surmised that the man, who was partly dressed, had got up, and while doing something to the stove, accidentally turned on the tap. The Jury returned a verdict of "Death by misadventure" in each case.

Ventilation in Gas Fires

THE DAVIS GAS STOVE CO., LTD., desire it to be known: (1) That their first Ventilating Gas Fire (see Fig. 1) was made as far back as 1906. (2) That the Davis Original Hygienic Gas Fire of 1912 (see Fig. 2) embodied a modified form of Canopy Ventilation; and (3) That the Canopy method of Gas Fire Ventilation has been improved upon by them in the Davis 1915–1919 Gas Fire construction, which ensures scientific ventilation by means of perforated side panels controlled by adjustable dampers, as endorsed by Mr. A. H. Barker, B.A., B.Sc., whose professional opinion is here quoted verbatim.

Further, that the Davis 1912 principle of Hygienic Gas Fire Construction has been adopted and retained by all gas-fire makers, practically without exception.

60, Oxford St., London, W. 1.

Invited to express his professional opinion as to Canopy and Side Ventilation in Gas Fires respectively,

MR. A. H. BARKER, B.A., B.Sc., &c., the eminent authority on Heating and Ventilation, writes:—

"I have not the least hesitation "in expressing my opinion as en- "tirely in favour of the second "proposal—namely, to allow the "secondary air to pass to the chim- "ney by way of the side grating "panels, controlled by dampers. In "my judgment, this proposal is "vastly superior to the other."

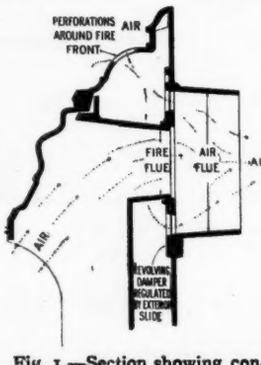


Fig. 1.—Section showing construction of the first Davis Ventilating Gas Fire (1906).

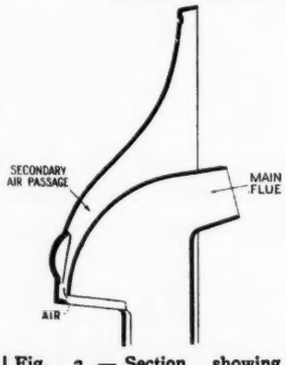


Fig. 2. — Section showing Secondary Air Passage of the Davis Hygienic Gas Fire (1912).

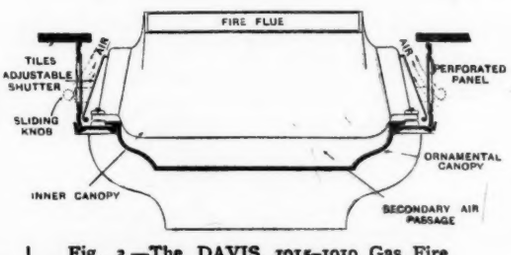


Fig. 3.—The DAVIS 1915–1919 Gas Fire Construction. Plan showing SIDE Ventilating Arrangement and Adjustable Shutters.

STOCK MARKET REPORT.

THE Stock Exchange has had another rather dull week so far as most markets are concerned, though happily not in all. The chief cause—notorious and only too vividly apparent to all eyes—lay, of course, in the organized labour troubles. A participant source to some extent might be found in the slow progress of things at Versailles. Nothing much was heard about the new War Bonds.

In the gilt-edged market, Home Government issues did not do badly. Some variable movements in Consols and War Loans took place during the week; but they closed much the same as they had opened. Home Rails continued dull, and refused to be cheered by any dividend announcements. Canadians and Argentines were flat. The Foreign Market was dull, and the French loans met with little support until just on the close. Russian were quite out of favour.

Business in the Gas Market showed a falling-off in point of volume; transactions in the three biggest companies being much below a fair now-a-days average. On the other hand, some of the less frequently negotiated issues attracted notice. The tendency varied in different lines. In Gas Light and Coke, the ordinary was easier; but all other issues were firm. South Metropolitan ordinary, too, was lower; the quotation receding 2. South Suburban and Tottenham were strong, especially in debenture stocks, and European advanced.

Bargains done for cash during the week were as follows: On Monday, Cape Town preference 8, Gas Light ordinary 71, 71⅛, 72, ditto maximum 57, Lea Bridge 96½, 97, Monte Video 9⅜, South African 13¼, South Metropolitan 74, 74½, 75, 76, ditto debenture 55, 55½, South Suburban debenture 89¾, Brighton and Hove preference "B" 96, Danish debenture 64½. On Tuesday, Bombay 6 1/16, Commercial 4 p.ct. 62, ditto 3½ p.ct. 58, ditto debenture 51, Gas Light ordinary 70, 70½, 71, ditto debenture 56½, 57½, Imperial Continental 118¼, 119, ditto debenture 72, 74, Primitiva preference 63s. 9d., ditto debenture (1911) 47, 47⅛, South Metropolitan 74, South Suburban 79½, ditto debenture 90¼, Tottenham "A" 93, 93¼, ditto "B" 65½. 66, Southend 5 p.ct. "B" 65, 65½. On Wednesday, Brighton and Hove original 141½, Continental Union 50⅛, Gas Light ordinary 70, 70½, ditto maximum 56½, ditto preference 72, ditto debenture 56½, 57½, Imperial Continental 118, 119, 119½, Monte Video 9⅜, Primitiva 37s. 3d., South Metropolitan 74, South Suburban 79½, Tottenham debenture 64¼. On Thursday, British 31⅛, Continental Union 51, European 13⅛ *ex div.*, Gas Light maximum 56½, ditto preference 71½, ditto debenture 57½, Imperial Continental 118½, 119, 119¼, 119½, Primitiva 37s. 6d., South Metropolitan 73½, South Suburban 79, ditto debenture 90, Tottenham debenture 66. On Friday, Bombay £6 0s. 6d., Commercial 4 p.ct. 63½, Continental Union 50, 50⅛, Gas Light ordinary 69⅛, 69⅞, 70, ditto debenture 56½, 57, Imperial Continental 118½, 118⅞, ditto debenture 73¼, Primitiva 37s. 3d., 37s. 6d., ditto preference 60s., ditto debenture 75, 75½, South Metropolitan 73, 73⅜, ditto preference 94, South Suburban 80, ditto debenture 90.

The Money Market was extremely variable, alternating from ease to a strong demand. The Bank rate is 4 p.ct., as fixed on April 5, 1917.

Bolton gas workers have applied to the Corporation for reduced hours without reduction in wages. They ask for a 47-hour week.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
183,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,551,868	,,	April 8	2¼	4½%	Alliance & Dublin Ord.	59—64	51—56	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	5⅞—6⅛	6/0/6—6/1/3
50,000	10	Feb. 26	18	11%	Bournemouth Gas and Water { 10 p.c.	20—30	22—24	..
888,110	10	,,	7	7%	B ¶ p.c.	15—15½	10½—11½	..
115,000	10	,,	6	6%	Pref. 6 p.c.	13½—14	9½—9¾	..
159,740	—	—	—	4%	4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	4½%	Brentford A Consolid.	261—266	78—81	..
734,920	,,	,,	11	4½%	Do. B New	304—309	72—77	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	77—82	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	52—64	..
317,880	,,	Feb. 26	11	8½%	Brighton & Hove Orig.	308—318	140—145	141½
344,300	,,	,,	8	6½%	Do. A Ord. Stk.	154—159	97—102	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
580,000	20	Mar. 26	12½	22/6	British	44—45	31½—32½	31½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
145,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3½—4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7½—8½	8
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,513,980	,,	Feb. 12	5/0/4	86/-	Commercial 4 p.c. Stk.	106—108	62—67	62—63½
560,000	,,	,,	5½	80/-	Do. 3½ p.c. do.	103—105	58—63	58
475,000	,,	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	51
800,000	,,	,,	4	—	Continental Union Ltd.	75—79	48—53	50—51
900,000	,,	,,	7	—	Do. ¶ p.c. Pref.	115—118	70—75	..
51,500	Stk.	Aug. 29	14½	121%	Croydon A 10 p.c.	..	160—170	..
278,400	—	,,	11½	10½%	Croydon B and C ¶ p.c.	..	135—140	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	193—195	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—85	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	13—14*	13½
16,298,975	Stk.	Feb. 10	4/17/4	22/4	Gas Light and Coke { 4 p.c. Ord.	98—102	69—71	69½—72
2,600,000	,,	,,	8½	8½%	3½ p.c. max.	76—79	56—54	56½—57
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	70—72	71½—72
4,674,850	,,	June 11	8	8%	3 p.c. Con. Deb.	72½—74½	56—58	56½—57½
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
92,500	,,	Mar. 12	5	4½%	Hastings & St. L. 5 p.c.	..	60—65	..
255,740	,,	—	3½	3½%	Do. 3½ p.c.	87—89	45—50	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	7⅞—8¼	..
86,600	Stk.	Sept. 12	9*	9½%	Hornsey ¶ p.c.	..	117—122	..
131,000	,,	Mar. 12	7½	6½%	Ilford A and C.	151—154	92—97	..
65,780	,,	,,	6¾	4½%	Do. B	115—118	70—75	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	159—160	117—122	118—119½
1,335,000	,,	Feb. 12	8½	8½%	Do. 3½ p.c. Deb. Red.	84—86	72—74	..
285,242	,,	Mar. 12	6¾	6½%	Lea Bridge Ord. 5 p.c.	119—121	93—98	96½—97
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A B	211—213 146—148	82—84	..
806,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
165,736	,,	Aug. 15	4½	4½%	Maidstone 5 p.c.	..	60—65	..
75,000	5	June 11	8	8%	Malta & Mediterranean	4½—4⅝	3½—3¾	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—97	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	9½—9¾	9⅜—9⅝
1,875,892	Stk.	July 29	4½	8½%	Newcastle&Gatsh'd Con.	99½—99¾	72½—73½	..
529,705	,,	June 26	8½	8½%	Do. 3½ p.c. Deb.	82—88	57—59	..
55,940	10	Feb. 26	7/16/0	7½	North Middlesex ¶ p.c.	14—15	9½—10½	..
800,000	Stk:	May 14	8	8%	Oriental, Ltd.	117—122	103—105	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	4—5	..
60,000	50	Feb. 26	18	9%	Porisea, Island B	128—131	78—83	..
100,000	50	,,	12	8%	Do. C	118—121	60—65	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅞—2⅛	37/8—37/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	3—3½	60/—63/9
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	74—76	75—75½
600,000	Stk.	July 31	4	4%	Do. ,, ,, 1911	..	46—49*	47—47½
346,198	,,	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	..
150,000	10	May 14	5	6/-	San Paulo { 6 p.c. Pref.	10½—11	7⅞—8½	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	40—43	..
125,000	Stk.	Mar. 12	10	10%	Sheffield A	228—234	170—173	..
209,984	,,	,,	10	10%	Do. B	232—234	170—173	..
528,500	,,	,,	10	10%	Do. C	230—232	168—170	..
183,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African.	10½—11½	13—14	13½
6,609,295	Stk.	Feb. 10	5/4/0	82/-	South Met. 4 p.c. Ord.	111—113	73—75	73—73
250,000	,,	July 12	—	5%	Do. Pref.	..	92—94	94
1,895,445	,,	July 10	8	8%	Do. 3 p.c. Deb.	72½—74½	54—56	55—55½
224,290	,,	Feb. 26	8½	6%	South Shields Con. Stk.	157—159	114—116	..
952,795	,,	,,	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	77—80	79—80
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	75—78	..
135,000	,,	Feb. 26	5	3½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	89—92	89½—90½
647,740	,,	May 14	5	8%	Southampton Ord.	99—102	67—70	..
190,000	,,	Feb. 12	7½	5½%	Tottenham { A 5 p.c.	135—138	92—97	93—93½
782,275	,,	,,	6	4%	District { B 3½ p.c.	115—117	87—89	65½—66
181,255	,,	June 26	4	4%	4 p.c. Deb.	87—89	64—65	64½—66
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
256,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109	87—88	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Feb. 26	8⅜	6⅜/9	Wandsworth A 5 p.c.	151—156	90—95	..
255,686	,,	,,	6¾	4⅜/9	Do. B 3½ p.c.	129—134	70—75	..
863,000	,,	,,	6½	4⅜/6	Wimbledon 5 p.c.	117—122	70—75	..
98,000	,,	,,	6¾	4⅜/9	Epsom 5 p.c.	121—126	72—77	..
88,416	,,	June 26	8	8%	3 p.c. Deb. Stk.	66—69	50—52	..

* *Ex div.*

ROYAL 8VO. CLOTH GILT, LETTERED, 15s. NET.

Clauses and Precedents in

ELECTRICITY, GAS, & WATER LEGISLATION.

Being a Comparison of the Provisions contained in the Model Bills, in Special and Municipal Acts, and in Provisional Orders, 1910 to 1914, relating to these Public Services.

Compiled and noted by **JACQUES ABADY,** of the Middle Temple, Barrister-at-Law.

By a careful examination of upwards of 450 Acts and Orders which contain clauses relating to Electricity, Gas, and Water Supply, the Author has brought together in a convenient form all the provisions of these Acts, with respect to the undertakings of both Municipal Authorities and of Companies.

WALTER KING, "GAS JOURNAL" OFFICES, 1, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

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